


# Saving for a stormy day? The Jamaican Government Savings Bank and the precautionary savings motive

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The Government Savings Bank of Jamaica (GSB) was created post-emancipation in order to serve the poor as a vehicle for precautionary savings and has been viewed as largely successful in this goal, at least after its restructuring in the late 1860s. We investigate this by examining GSB depositor behaviour after income shocks due to hurricanes. To this end, we combine digitized parish-level GSB account information with a hurricane damage index generated from historical storm tracks. Our results show little evidence of a precautionary savings motive by GSB account holders in that while net account balances and deposits drop after hurricanes, withdrawals and the number of accounts closed also fall. Additionally, the net decrease in account holders seems not to be driven by small savers, who are likely to be the poorest. Our findings are thus more in line with the GSB potentially being used to finance non-necessary consumption.

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## I

An important consequence of the expansion of the wage system and the growth of small-scale farmers and artisans in the Jamaican plantation economy after slave emancipation in 1834 was the stark rise in small monetary profits among the former slaves and freedmen (Callender 1965). But this also led to a general concern that these financial gains were being spent on the purchase of lands or non-necessary goods rather than being saved (BPP 1842). In response, in 1836 the Jamaican colonial government passed a regulatory framework for establishing privately run savings banks, modelled on the trustee savings banks first created in Scotland to encourage thrift among the poor (Horne 1947). The first of these in Jamaica was opened just two years later in

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## I



Kingston, followed by eight others that spread across the island over the next 18 years. However, a scandal in 1867, when the secretary of one of the banks absconded with a considerable sum and caused widespread panic among account holders, resulted in their replacement by the Government Savings Bank (GSB) in 1870. Centrally operated by the colonial government, with main branches located in each of the parishes, the GSB offered government-backed, anonymous accounts for small savers that accrued interest at a uniform rate (Callender 1965). It persisted in this general form for over a hundred years until 1973 when it was absorbed by the Workers Savings and Loans Bank.<sup>1</sup>

In contrast to many savings banks elsewhere (Fishlow 1961; Bunbury 1995; Ó Gráda 2003, 2008; Célérier and Tak 2023), the GSB over its long existence was widely perceived as having been rather successful in terms of providing a savings vehicle for a large number and wide array of lower-income individuals (DR 1882–3, 1891–2; Callender 1965; Kirton 1977; Holt 1992).<sup>2</sup> Some of the original motivation for creating such banks, both in and outside Jamaica, was that lower-income individuals would be using their deposited savings for when they fell on hard economic times and for old age (DR 1880–1; Horne 1947), rather than spending the money on non-necessary purchases.<sup>3</sup> In colonial Jamaica, this precautionary savings motive was arguably particularly important since as a small open agricultural economy it was highly dependent on a few export crops,<sup>4</sup> and thus extremely vulnerable to global price and environmental shocks. For example, the manager of the GSB noted that the objective of savings ‘cannot be that of profit, but of security, and being in possession of a sum, however small that may be, in the event of pressing necessity’ (DR 1880–1, p. 117). However, to what extent savings deposited at the GSB served to buffer short-term unanticipated negative income shocks for its account holders is unclear. While there were some cursory observations of such behaviour made by the GSB after specific environmental disasters or depressions in the export crop market,<sup>5</sup> it was also noted that some savings were likely used for targeted expenditure, such as, for instance, during an international exhibition in Kingston (DR 1889–90).

<sup>1</sup> Compared to GSB, the Workers Savings and Loans Bank had a substantially expanded mandate in terms of how it could serve lower-income individuals; see Kirton (1977).

<sup>2</sup> One should note, however, that these savings banks often differed starkly across countries. For example, Wadhvani (2011) points out that in countries with centralized and nationalized savings-bank systems, these faced fewer competing institutions.

<sup>3</sup> Governments establishing savings banks were, in particular, hoping that individuals through saving their income would be less likely to become a financial drain on the social welfare system in the face of income shocks (Horne 1947). This was probably less of a motivation at the time in colonial Jamaica as the social welfare system remained relatively undeveloped for a large part of the post-emancipation colonial period (Osei 2001). More specifically, the first centralized poor relief system was implemented in 1886, providing both indoor relief, mostly in terms of serving as an infirmary, and outdoor relief intended only for those destitute that were physically or mentally not able to work.

<sup>4</sup> These were primarily sugar and, starting at the end of the nineteenth century, bananas (Eisner 1951).

<sup>5</sup> See, for example, DR (1894–5, 1897–8, 1904–5, 1912–13).

In this article, we explicitly investigate how the account transactions of the Jamaican GSB responded to negative income shocks and thus may have served as a precautionary savings mechanism for small savers. An ideal direct way of testing this would be to combine time-varying individual-level account data with information on the individual exposure to negative income shocks and see how the latter affects the former. Given that individual account data is not available for the GSB, we here instead rely on measuring the regional response in account transactions to regional shocks detrimental to income flows. More specifically, we combine parish-level account information with a proxy of parish-level hurricane damages constructed from historical storm tracks covering over 30 years of the GSB shortly after its inception (1874–1906). Hurricanes arguably serve as a particularly suited measure of negative income shocks in colonial Jamaica since these were largely unanticipated, but still not uncommon shocks to local agricultural production (Huesler and Strobl 2023), which was the main source of income for most lower-income individuals during the time period examined (Eisner 1951).

In the small existing literature on savings banks, the precautionary role of savings has as of date not yet been directly empirically tested. For example, exploring the occupation and marital status of depositors at three different English savings banks, Maltby *et al.* (2013) provide suggestive evidence that account holders may have opened and maintained accounts for reasons other than long-term thrift and prudence. Both Kelly and Ó Gráda (2000) and Ó Gráda and White (2003), in contrast, examine how financial crises resulted in contagion behaviour among depositors for the Emigrant Industrial Savings Bank in New York, while Ross (2013) similarly explored this for the Glasgow Savings Bank. In the paper that touches most closely on investigating the precautionary role of savings banks, Alter *et al.* (1994) combine the complete history of individual accounts of the Philadelphia Saving Fund Society opened in 1850 with census information on the account holders' sex, age, occupation and household relationship. The authors show that deposits were infrequent and substantial and that particularly female servants accumulated large savings, interpreting this as evidence for both a targeted expenditure and life-cycle role of savings. However, Alter *et al.* (1994) note that they are unable to draw any direct conclusions concerning the precautionary motive, but instead argue that this was unlikely because the withdrawals upon the closing of accounts was substantially greater than general withdrawals.<sup>6</sup>

Our results show that, as would be expected, after hurricanes the net total balance, deposits, and the net number of account holders at the GSB fell. However, at the same time the number of withdrawals and the number of accounts closed also decreased. Moreover, the fall in account holders is not driven by the very small savers. Furthermore, evidence from a distinction between Indian immigrant and the

<sup>6</sup> Payne (1967) also notes that precautionary saving at the Scottish savings bank was more likely among workers, but is also not able to test this.

general population GSB participants, or from rural branches, also does not provide an explanation for these patterns. Rather, the observed behaviour may be more suggestive of savings at the GSB being perhaps used to finance future non-necessary expenditures.

The remainder of the article is organized as follows. In the following section we provide the general historical background of the GSB and the relevant role of hurricanes in colonial Jamaica. Section III describes the construction of our data and the econometric methodology. Results are provided in Section IV. We provide a simple aggregate comparative study to British savings banks in Section V. The final section concludes.

## II

The first regulatory framework to establish savings banks in post-emancipation Jamaica was passed in 1836, in view of the recognition that ‘certain regulations should be made for the establishment and management of banks for savings in this island, for the safe custody and increase of small savings belonging to the industrious classes of his Majesty’s subjects’ (LoJ[7] 1836). Importantly, these banks were to be run by private trustees and managers rather than by the colonial government and thus can be considered essentially private institutions, although they were required to deposit the monies either with public banks or commissioners of public accounts. The interest rate to be paid on deposits was left to the discretion of the commissioners of each bank, but capped at a maximum of 4.5 per cent per annum. Persons were limited to depositing no more than £200 per year, and the principal and interest combined were to be no greater than £400 at any point in time. The first savings bank was established in 1838 in Kingston and others subsequently opened in the parishes of Manchester, St James, Clarendon, Trelawny, St Davids, St Thomas, St Ann, Hannover and St Mary during the following 18 years (Callender 1965; Watts 2016). By 1865 there were a total of 2,372 depositors with a total of amount of £55,954 of deposits in the nine existing private savings banks (Callender 1965).

On 22 June 1867, it was discovered that the secretary of the Trelawny Savings Bank had committed a number of forgeries amounting to approximately £8,000, resulting in the bank suspending its operation, and causing widespread panic.<sup>7</sup> Moreover, the savings bank in St Mary’s closed two years later, reducing the number of operating banks to just seven. In response to these developments, the colonial government under the governorship of John Peter Grant passed Law 20 of 1870, which enacted the replacement of the seven existing private savings bank with a government-run savings bank, with the specific purpose ‘to give every depositor ... the direct security

<sup>7</sup> The Trelawny Savings Bank was at the time the third largest of the savings banks and located in one of the major sugar-producing parishes (Watts 2016).

of the government in this island for the due re-payment of all moneys so deposited ...' (LoJ[20] 1870).<sup>8</sup>

Apart from explicitly guaranteeing the security on the deposits and interest payments, the GSB differed in a number of other important characteristics compared to its private predecessors, which offered considerable advantages to depositors.<sup>9</sup> Firstly, the GSB could no longer disclose the identity of account holders, except to the governor or revenue commissioner, providing anonymity to depositors. Additionally, depositors were furnished with a passbook that allowed them to make deposits or withdrawals at any branch. In terms of the particulars of the accounts, the deposit limits under the GSB were set at a minimum of one shilling<sup>10</sup> and, similarly to the previous private savings banks, at a maximum of £200. Any account below £1 or above £400 would additionally no longer bear any interest, although an exception was made with the regard to the latter in the 'case of a public officer depositing a sum of money as security for his good behaviour in office' (LoJ[20] 1870), and for charitable and friendly societies which were allowed deposits of up to £500.<sup>11</sup> The interest rate to be paid annually on deposits was originally set at 4 per cent. If a depositor wanted to withdraw a sum greater than £5 then he or she needed to provide written notice, upon which approval was guaranteed within a week if the amount did not exceed £50.

One should note that, in contrast to the previous private savings banks, a considerable amount of effort was put into encouraging the lower-income classes to deposit their savings in the GSB, with a view to targeting the agricultural working class (Watts 2016). For instance, on 12 August 1870, a circular was sent to all clergy and magistrates of the parishes asking them to outline to the local peasantry the benefits of depositing at the GSB. At the same time, as pointed out by Augier (1954) and Eisner (1951), increasing the number of deposits also was of immediate interest to

<sup>8</sup> As argued by Watts (2016), the replacement of the set of private savings banks with a government-operated one was most likely partially facilitated by the dissolution of the Jamaican assembly in 1866 after the Morant Bay rebellion in 1865, and the consequent transformation of government to crown colony rule, where the governor had considerably more power and there was direct imperial control of the financial system.

<sup>9</sup> All depositors at the original private savings banks were given the opportunity to transfer their existing accounts to the GSB before their closure (Callender 1965; LoJ[31] 1870).

<sup>10</sup> In 1881, the GSB also established what were known as penny banks as a new department. These were meant for those that could not afford the minimum deposit required under the GSB (Watts 2016), in particular for children or the very destitute. Ultimately a penny account could be transferred to a regular GSB account once it reached £1. Importantly, however, the government took no responsibility for these penny banks. In practice, these types of savings mechanisms were used mostly by school children (DR 1881–2).

<sup>11</sup> One should note that originally, there was nothing in the regulation that prevented an individual or organization from circumventing the maximum limit by opening several accounts, but in 1878, new rules were introduced to avoid such practices (DR 1878).

the local parish governments since the funds were to be used partially to finance infrastructure investment throughout the island.

Since its inception, a number of changes in terms of the workings of the GSB took place that may have affected depositors' behaviour. First of all, the interest rate was reduced from the original 4 to 3 per cent in 1882, and then to 2.5 per cent in 1897. While there appeared to be no drop in deposits for the former change (DR 1881–2), after the reduction in 1897 the manager of the GSB at the time noted that this caused several of the large depositors to withdraw their money, but did not appear to have any effect on smaller depositors (DR 1897–8).

Secondly, there were also a number of innovations in order to facilitate further ease of accessibility to depositors. Shortly after the start of operation, the GSB opened nine sub-branches in addition to the 13 main branches in order to ease access for those that lived some distance from the latter (DR 1871–2).<sup>12</sup> Over the years, further sub-branches were opened and closed, fluctuating between nine and 12 in total, at least until 1906.<sup>13</sup> Additionally, starting in 1879, the main branches increased the opening hours from twice weekly from 11 a.m. to 2 p.m. to daily at the same time during the week.<sup>14</sup> In view of the large number of servants and manual labourers in Kingston who received their wages on Saturday nights, the Kingston branch furthermore introduced auxiliary opening hours from 7 to 9p.m. on Saturday nights in 1881. In the same year, the GSB also started allowing individuals to send their deposits via registered post free of charge. Moreover, depositors in the country parishes could withdraw more than the maximum limit by telegraph 'should circumstances need an immediate withdrawal' (DR 1881–2, p. 205). Finally, individuals who had emigrated to work on the construction of the Panama Canal were as of 1883 given the opportunity to make deposits to their GSB accounts at the Jamaican consulate in Panama, and a similar arrangement was made for emigrants to Cuba (Watts 2016). It appears that a number of emigrants took advantage of this opportunity (DR 1905–6; Senior 2014), although emigration may have also caused the closing of some GSB accounts (DR 1883–4).

Indian immigration to Jamaica as indentured labourers began in 1845 when, after emancipation, there continued to be a high excess demand for cheap labour by plantation owners. While the number of immigrants from India was substantial in the first few years, this ceased for some time due to disputes in the colony and only resumed 1859, although at a much smaller scale (Kumar and Kumari 1999). In response to plantation-owner demands that more public funds be diverted to the Indian immigration programme in 1879, the colonial government introduced the Immigration

<sup>12</sup> The main branches were located one in each parish, except, given its proximity to Kingston, in St Andrew, where a main branch was only opened in 1895.

<sup>13</sup> After 1906, information on the number of sub-branches was no longer reported.

<sup>14</sup> The main opening hours of the sub-branches, however, were less frequent, ranging anywhere from once a week to once a month, where this was determined to suit the availability of the assistant collector (DR 1876).

Finance Law, which established a fund for loans to planters to finance immigration in the form of indentureship. Importantly, the GSB was intended to contribute to the financing of such loans, in part through the deposits made by Indian immigrants into GSB accounts (Watts 2016). Indian immigration had a considerable impact on the account transactions of the GSB. For one, nearly one-third of the around 37,000 Indian immigrants in the programme became depositors (DR 1888–9; V. A. Shepherd 1986). Additionally, as pointed out by V. Shepherd (1994), most of the Indian immigrants that saved with the GSB were those that planned to return to India at the end of their indentureship. For instance, in the GSB annual reports during the 1880 to 1906 period, the manager observed on five occasions that increases in the number of deposits and withdrawals could be attributed to the arrival or departure of ships carrying Indian immigrants (DR 1880–1, 1884–5, 1887–8, 1888–9, 1901–2, 1902–3, 1905–6). The immigration programme from India officially ended in 1920 (Kumar and Kumari 1999).

As an island located in the Atlantic Ocean Basin, Jamaica is potentially subject to tropical cyclones throughout the Atlantic hurricane season, spanning the period from June to November, with a probability of about one major storm seriously affecting the island every 10 years (Brown *et al.* 2017), although smaller ones may also cause damage (Huesler and Strobl 2023). Importantly, until the 1930s there was essentially no hurricane warning system in place, so that any storm can be viewed as having been largely unanticipated prior to this.<sup>15</sup> There was also no explicit post-disaster relief system during this time. Instead, the British colonial office prioritized colonial control and fiscal prudence so that financial relief depended mainly on charity donations from Britain (Webber 2018). The local government similarly did not provide any systematic financial aid in response to hurricanes.<sup>16</sup> Rather, the only official relief that could be obtained by individuals was via the local poor relief programme (Bryan 2000). More specifically, poor relief was available to those who became ‘destitute and unable to work because of physical or mental circumstances, to also include those destitute that may be able to work but suffered from exceptional circumstances of destitution, arising from drought, epidemic disease or such like causes...’ (LoJ[6] 1886, p.16). The aid offered was either as indoor relief, offering mostly medical services to those residing in poor houses, or as outdoor relief, which was temporally limited and the amounts paid meagre (Bryan 2000; Roper 2018).

<sup>15</sup> It is only in the 1930s that reconnaissance aircraft were employed by the United States to anticipate hurricanes, so that prior to this storm warnings were limited to ship sightings. Although the United States did briefly establish a hurricane warnings office in Jamaica during the Spanish–American War, primarily relying on reported incidences of storms that had already affected the region (Dunn and Miller 1971), it was moved to Havana after the war ended in 1899 (Sheet 1990).

<sup>16</sup> Two exceptions were the loan programmes offered by the government after destructive hurricanes in 1903 and 1912, but these were restricted to planters and agricultural loan society members, respectively.

There was a general awareness at the GSB that damaging storms potentially affected the financial transactions of its account holders. For instance, it was stated that in part due to a cyclone in 1879, the GSB ‘passed through a severe trial’ (DR 1880–1, p. 116). Also, after a hurricane struck on 11 August 1903, killing at least 60 and causing an estimated \$10,000 in damage<sup>17</sup> (*New York Times* 1903), there was mention that ‘Kingston shows a considerable net increase of withdrawals ..., the reasons for which may undoubtedly be traced to the general depression which has overshadowed the whole community, more or less, darkly, since the 11th of August last’ (DR 1903–4, p. 213), in ‘Portland considerable sums were withdrawn and subsequently redeposited under the pressure of hurricane damage’ (p. 213), in ‘St. Mary borrowed moneys were lodged in the Savings Banks and drawn as required’ (p. 213), while ‘the decrease in the Bank’s business in Trelawny is due to the decline in the sugar industry, as well as to the effects of the cyclone’ (p. 213) and ‘the figures for which Clarendon and St. Catherine are responsible are attributed to the disastrous effects of the hurricane’ (p. 214). In some instances, such impacts were believed to have endured up to three years after the storms (DR 1904–5, 1905–6).<sup>18</sup>

While during our period of analysis (1874–1906) overall Jamaican economic growth was fairly stagnant (Eisner 1951),<sup>19</sup> it actually was a time of considerable transition for the primarily agriculture-based economy. More specifically, the sugar industry, once the prime driver of the colony’s wealth, had, due to slave emancipation in 1834, and gradual elimination of British sugar duties (Bulmer-Thomas 2012; Higman 2021; Huesler and Strobl 2024a), fallen from constituting at the turn of the nineteenth century over 90 per cent of total exports to only 63 per cent by 1870.<sup>20</sup> This decline of the importance of sugar production continued with the emerging competition from European beet root sugar in the 1880s and the failure of many plantations to update their technology (Huesler and Strobl 2024a), so that by 1906 sugar and rum only constituted 7 per cent of total exports. At the same time as the sugar industry began to slowly wane, starting in the 1870s, banana production as a prized export crop began to take momentum (Soluri 2006; Chapman 2009). More precisely, while in

<sup>17</sup> Using the £/\$US exchange rate in 1903 (4.86) and the estimated Jamaican gross domestic output of £11,391,900 in 1910 (Eisner 1951) implies that the damages likely constituted around 20 per cent of national income.

<sup>18</sup> The manager of the GSB noted in 1905 that the fact that the total amount deposited was less than that withdrawn ‘is mainly due to a general depression, the country not having fully recovered from the widespread effects of the disastrous hurricane of two years ago’ (DR 1904–5, p. 225) and in 1906 that for some parishes ‘in which there is apparently a less favourable state of things existing, local circumstances are sufficiently accountable, such as the depression of trade brought about by the disastrous hurricane of August 1903, the effects of which are still being felt’ (DR 1905–6, p. 279). Similarly, the *Gleaner* points out that the ‘Savings Bank deposits had been going down and down since the hurricane’ (1904, p. 8).

<sup>19</sup> Jamaica’s GDP per capita rose marginally from £11.2 to £13.7 from 1870 until 1890 and roughly remained at this level until at least 1910 (Eisner 1951).

<sup>20</sup> Calculations done using figures from Cumper (1957) and Bulmer-Thomas (2012).



1870 bananas constituted less than 1 per cent of total exports, by 1906 this had risen to 47 per cent, and as such became Jamaica's primary export product.

With regard to these structural changes in Jamaica's agricultural sector, one should note that while the decline in the sugar industry would have primarily affected the large plantation owners who were less likely to have been depositing their money in the GSB,<sup>21</sup> there were also a non-negligible number of small sugar farmers who supplied the plantations with sugar for processing. For instance, it has been estimated that around the turn of the twentieth century there were around 6,000 small peasant farmers with small mills who planted around 5,000 acres of sugar cane mainly for local consumption (Norman 1897). At the same time, the majority of banana producers during our period of interest would also have been small peasant farmers (Soluri 2006). Moreover, while many small farmers were involved in Jamaica's two main export crop sectors, most were primarily growing ground provisions for their own consumption, as well as for sale on the internal market for monetary earnings.<sup>22</sup> Thus, given the proportion of the total employment constituted by all of these small peasant farmers ( $\approx 60$  per cent),<sup>23</sup> one suspects that it was these individuals that would have constituted the majority of account holders of the GSB. For instance, Holt (1992) argues that the rise in GSB account holders in Portland, one of the major banana-producing parishes, was due to the rise of the banana industry.

As noted in above, the GSB explicitly encouraged the use of its facilities by emigrants. In this regard, Jamaican emigration increased substantially in the late nineteenth century due to rising population pressure on land, natural disasters and declining economic opportunities (Watts 2016). Of particular importance with respect to our time period of analysis was the construction of the Panama Canal starting in 1881, which attracted a large number of Jamaican males. For instance, around 78,000 Jamaicans emigrated from 1881 to 1990, with the majority most likely having gone to Panama (Newton 2004).<sup>24</sup> As was noted in the GSB annual report (DR 1883–4), this exodus may have been behind the decline in deposits in several parishes. The outflow of Jamaicans continued into the early twentieth century, with total emigration estimated to have been around 91,000 from 1891 to 1915 (Newton 2004).

### III

Our information on parish-level GSB accounts is taken from a number of sources. For the period prior to 1881, we use summaries of the GSB accounts provided in Jamaica's

<sup>21</sup> The plantation owners are much more likely to have availed the services of the Colonial Bank and a few Canadian commercial banks (Callender 1965; Huesler 2024).

<sup>22</sup> For example, between 1870 and 1910 ground provisions was on average over 50 per cent of agricultural output, constituting over 65 per cent of agricultural employment.

<sup>23</sup> Calculations done using figures from Eisner (1951) on the percentage of persons employed in agriculture and the percentage of persons with farms less than 5 acres.

<sup>24</sup> For example, Roberts (2013) estimates that between 1883 and 1884, 24,300 went to work on the Panama Canal.

Colonial Blue Books. From 1881 onwards, the Departmental Reports of Jamaica published the *Annual Report of the Workings of the Government Savings Bank*, although the details provided become increasingly limited over time. Nevertheless, while the content of each summary in the Blue Books and the annual reports varied considerably over the years, there are a number of variables that are consistently provided for a relatively long time period. More specifically, one can construct a consistent series of parish-level information on the total balance of accounts, the total deposits, the total withdrawals, the number of accounts opened, the number of accounts closed and the number of accounts remaining at the end of each fiscal year. Additionally, there is information on the total parish-level value of the number of accounts classified according to whether they are £5 and below, above £5 and below £10, above £10 and below £100, above £100 and below £200, and above £200.

Parish-level annual information is also available for Indian immigrants in terms of the total balance of their accounts and the number of account holders. We use these to generate the equivalent non-Indian immigrant information from the total balance and account holders, allowing a breakdown along these aspects for both groups. There is also an occupational breakdown of immigrant and non-immigrant account holders for the years 1875 and 1889, providing a snapshot of occupational composition and comparison across the two account holder groups. To make the data comparable to occupations held by the wider population, we aggregate the occupational categories to coincide with the data compiled by Eisner (1951), i.e. into Agriculture, Industry and Construction, Commerce, Professions and Domestic Service.

The common fiscal years for each of the total and Indian versus non-Indian components breakdown are available from 1874 until 1906, with data for the fiscal years 1875, 1878 and 1880 missing for at least one of the variables. We thus keep as our main sample all but the missing fiscal years over this period. One should note that the fiscal year is defined as running from October until September until the year 1889, and then readjusted to run to be from April until March.<sup>25</sup>

Finally, for a shorter subperiod, namely for the fiscal years running from 1874 until 1906, exclusive of the fiscal years 1875, 1878 and 1880, we also have information on the total amount of deposits and withdrawals for each of the rural sub-branches of the GSB and their town of location. To calculate the total amount of deposits and withdrawals for the main branches, we subtract the sum of the branch-level values from the parish-level totals. We assume that the main branches are located in the capital city of each parish. In total, there are 14 main branches in each of the parishes and 22 sub-branches. The 22 sub-branches are located in 13 of the parishes, with the exception of St James. The largest number of sub-branches are in St Thomas (four), while there are two in Clarendon, Manchester, Portland, St Catherine, St Elizabeth and

<sup>25</sup> Thus, the fiscal year of 1889 in our data covers only six rather than twelve months.

Trelawny. All monetary values are converted to 1906 prices using the deflator available from the Bank of England.<sup>26</sup>

As noted by Grabich *et al.* (2015), an important challenge in measuring the local effect of hurricanes is the misclassification of storm exposure. Existing studies have tended to use simple incidence indicator variables or some other fairly crude measure of damages. However, in reality, the damage due to hurricanes can differ widely across storms and space (Strobl 2011), and this heterogeneity should ideally be captured in any analysis of the local impact of such storms. Here we use a parish-level measure of exposure to damaging hurricane winds constructed from historical tropical storm tracks within a physical wind field model. In order to construct our index we follow the approach of Emanuel (2011), which assumes that local damages are related to wind exposure in a cubic manner above a given threshold.<sup>27</sup>

To measure the wind speed  $V$  for each storm  $s$  at time  $j$  in each parish  $i$ , we employ the tropical storm wind field model developed by Boose *et al.* (2004), which is based Holland (1980) and given by:

$$V_{ijs} = GF \left[ V_{js}^m - S(1 - \sin(T_{ijs})) \frac{V_{js}^h}{2} \right] \left[ \left( \frac{R_{js}^m}{R_{ijs}} \right)^B \exp \left( 1 - \left[ \frac{R_{js}^m}{R_{ijs}} \right]^B \right) \right]^{\frac{1}{2}} \quad (1)$$

where  $V$  is the wind speed at point  $i$ , measured here as the centroid of a parish,  $V^m$  is the maximum sustained wind velocity anywhere in the hurricane,  $T$  is the clockwise angle between the forward path of the hurricane and a radial line from the hurricane centre to point  $i$ ,  $V^h$  is the forward velocity of the hurricane,  $R$  is the radial distance from the centre of the hurricane to point  $i$ ,  $R^m$  is the radius of maximum wind speed, and  $G$  is the gust wind factor (water = 1.2, land = 1.5). Of the remaining parameters,  $F$  is a scaling parameter for surface friction (water = 1.0, land = 0.8),  $S$  is the asymmetry due to the forward motion of the hurricane (1.0) and  $B$  is the shape of the wind profile curve (1.2). These values have been verified in Boose *et al.* (2001) and Boose *et al.* (2004). We approximate  $R^m$  following Elliott *et al.* (2015).

In order to operationalize equation 2, we use tropical storm track data from the HURDAT database, which provides the location of the eye and the maximum wind speed of tropical storms in the North Atlantic Ocean Basin tracks every six hours since 1851, although with lower quality prior to 1870 (Chylek and Lesins 2008). We linearly interpolated these storm tracks to generate hourly storm centres. These interpolated tracks are used to generate the parameters  $V_m$ ,  $T$ ,  $V_h$  and  $R_m$ , and then ultimately  $V$  from equation 2 for every centroid of every parish for every

<sup>26</sup> [www.bankofengland.co.uk/statistics/research-datasets](http://www.bankofengland.co.uk/statistics/research-datasets)

<sup>27</sup> Damages are related to wind speed in a cubic manner due to the nature of energy dissipation of tropical storms. While hurricanes typically also cause damages through storm surge and rainfall, these features tend to be strongly correlated with wind speed (Zhai and Jiang 2014).

hour of a tropical storm's lifetime.<sup>28</sup> Our hurricane destruction index,  $H$ , in any year  $t$  is then:

$$H_{it} = \sum_{s=1}^{s=S} \max(V_{ist}^3) \quad \text{if } V_{ist} \geq 119 \text{ km/hr} \quad (2)$$

Thus, for each year for each parish we sum the cubic value of the maximum wind speed of tropical storms if the wind exposure is at least 119 km/hr, i.e. of Saffir Simpson Scale strength of one.<sup>29</sup> One should note that the wind field model and input data as outlined above provide us with an estimate of hurricane damages, i.e.  $H_i$  for each year for each parish. The years  $t$  are defined so as to coincide with the fiscal years of accounting of the GSB. For the branch level of data, we use the centroid of the town that the branch is located in instead of the centroid of the parish for point  $i$  in order to better capture the branches most likely clientele and their exposure to hurricane damages.

To control for population changes within parishes, we use data available from the 1871, 1881, 1891 and 1911 population censuses,<sup>30</sup> which provide total population by parish. We linearly interpolate between these years to obtain proxies of annual parish-level population.

The underlying theoretical framework for our econometric analysis of the savings behaviour of GSB clientele is based on the reasons that persons save, similar to Alter *et al.* (1994). More precisely, one can consider three motives for people to save their earnings in a bank like the GSB. Firstly, individuals may save for precautionary reasons, i.e. in order to smooth consumption in the face of unanticipated income shocks (Leland 1968). Smoothing consumption over one's lifetime may also be a motivation for saving, termed life-cycle savings (Modigliani and Brumberg 1954), as, for example, when people save during their expected high-earning years to be able to consume more during their expected low-earning periods of their life. Finally, there may also be target savers who save for specific planned expenditures in the future (Musgrave 1959). One should note that the latter motive is more common when financial markets are poorly developed (Alter *et al.* 1994), as they were in Jamaica during our period of analysis.

Our empirical analysis enables us to investigate whether the data are consistent with the precautionary motive. More specifically, we use incidences of hurricanes as unanticipated shocks to incomes, which may have caused GSB clientele to engage

<sup>28</sup> We also experimented with using the geographic coordinates of the main town in every parish. This did not change our results in any noticeable manner.

<sup>29</sup> In the North Atlantic Ocean Basin tropical storms are usually measured according to the Saffir Simpson Scale, where strength one is the threshold above which a storm is considered of hurricane strength. At this lower threshold there will be at least some damage to basic structures (Taylor *et al.* 2010).

<sup>30</sup> No population census was taken in 1901.

in behaviour consistent with precautionary savings. In this regard, one would expect that a damaging hurricane in a parish would induce its potential savers to reduce their deposits, increase their withdrawals and possibly close accounts, while at the same time also being less likely to open new accounts, as they try to temporarily smooth their consumption needs due to the loss of income. Additionally, it seems likely that it would have been the poorer account holders, with smaller sums in their accounts, who would have availed themselves of their savings and reduced their numbers.

Our goal is to estimate the effect of hurricane damages on various aspects of the GSB accounts. To this end, we estimate a standard linear fixed effects model (Wooldridge 2010):

$$\text{asinh}(Y_{it}) = \alpha + \sum_{j=0}^2 \beta_{H_{t-j}} H_{it-j} + \beta_{POP} POP_{it} + \beta_{POP^2} POP_{it}^2 + \lambda_t + \mu_i + \epsilon_{it} \quad (3)$$

where  $\mathbf{Y}$  is a vector of savings bank account components,  $H$  is the hurricane damage index from equation 2, and subscripts  $i$  and  $t$  indicate parish and annual time indicators, respectively. The terms  $\lambda$  are year and  $\mu$  parish specific indicator variables, and  $\epsilon$  is the error term. To diminish the possible influence of outliers in the variables contained in  $\mathbf{Y}$ , we use their inverse hyperbolic sine values. Parish-level population,  $POP$ , and its value squared are included to allow for possibly non-linear trends in population growth across parishes. We allow for potential non-contemporaneous effects of  $H$  by including up to two years of lags of its value in equation 3.<sup>31</sup> To take account of both spatial and serial correlation, standard errors are calculated as recommended by Driscoll and Kraay (1998).

Importantly, one should note that an integral part of our estimation strategy that enables us to identify the causal effect of hurricanes is allowing for time invariant differences across parishes in the form of  $\mu_i$ . More precisely, while the actual storm events are arguably exogenous and unanticipated, there may well be differences in the probability distributions of these events occurring across parishes, and this could be reflected in the size and composition of the local population distribution. Assuming that this local distribution of potential damages due to hurricanes, or at least the perception of it, is time invariant, then controlling for parish specific, time invariant differences means that equation (3) leaves us with a variation in  $H$  that can be considered as random, unanticipated, realizations from it. This arguably allows the causal interpretation of the  $\beta_{H_{t-j}}$  coefficients on  $H$ .

Finally, since the dependent variables in  $\mathbf{Y}$  are used in their inverse hyperbolic sine transformation, the coefficients  $\beta_{H_{t-j}}$  are not directly interpretable as linear marginal effects or elasticities. Rather, as shown by Bellemare and Wichman (2019), one can approximate the elasticity of the dependent variable with respect to a (continuous)

<sup>31</sup> We also experimented with further lags, but these proved to be insignificant in all specifications. Detailed results are available from the authors.

independent variable for a given value of the independent variable. In our case, the elasticity with respect to  $H_{t-j}$  would simply be  $\beta_{H_{t-j}} \times \overline{H_{t-j}}$  for a given value  $\overline{H_{t-j}}$ .

#### IV

We depict the aggregate trends in the total balance and the amounts deposited and withdrawn in [Figure 1](#). The total balance of savings at the GSB rose steadily until it peaked at £501,310 in 1896, after which it started to decline, reaching £409,012 by 1906. Relative to GDP in the island, as estimated by Eisner (1951), these totals constituted around 0.41 per cent in 1874, 0.54 per cent in 1890 and 0.36 per cent in 1906.<sup>32</sup> Using Eisner's (1951) estimated subcomponents of GDP also make it possible to gauge the island-wide annual savings deposited in the GSB relative to total savings in the economy. More specifically, the corresponding percentages would be 7.2, 7.5 and 4.5 per cent for the years 1874, 1890 and 1906, respectively. The parish-level summary statistics from [Table 2](#) show that the mean parish total amount credited at the GSB was around £33,000, but with considerable variation.

The total amounts deposited and withdrawn shown in [Figure 1](#) generally follow each other's movements closely and are roughly similar until about 1897, where withdrawals are clearly larger than deposits. Examining the parish-level statistics in [Table 1](#) shows that on average withdrawals are about £600 larger over our sample period. As with the total balance, for both the standard deviation is nearly double that of the means. These inflows and outflows constitute about 50 per cent of the total balance.

The total number of account holders increased steadily over our entire sample period, rising from a little over 5,000 in 1874 to stand at close to 35,000 by 1905. Part of this was of course due to the substantial population growth in Jamaica over this period (Roberts 2013). Thus, relative to the total population, the growth in account holders was substantially more muted, i.e. it rose from 0.44 to 0.58 per cent, with the highest share in 1884 standing at a little over 1 per cent. At the parish level, on average there were about 1,600 accounts open, with as few as 99 (St Elizabeth in 1874) and as many as 17,990 (St Andrew in 1906). While the number of accounts opened and closed generally follow the same pattern, there are some clear discrepancies, as in for instance in 1897. The average number of accounts opened in a parish in any year is also slightly higher than those closed in a parish, and these constitute 17.2 and 12.8 per cent of remaining accounts.

Data available for the occupational breakdown in 1875 and 1889, shown in [Table 2](#), provide insight into where account holders were employed. More specifically, the largest share of account holders were in professional occupations (40.6 per cent), followed by 34.4 per cent in agriculture, 9.9 per cent in domestic services, 9.3 per cent in industry and construction, and the least amount in commerce (5.8 per cent).

<sup>32</sup> For the 1870s and early 1900s, Eisner (1951) only has estimates for 1870 and 1910, so calculations for 1890 and 1906 are done relative to these values, respectively.

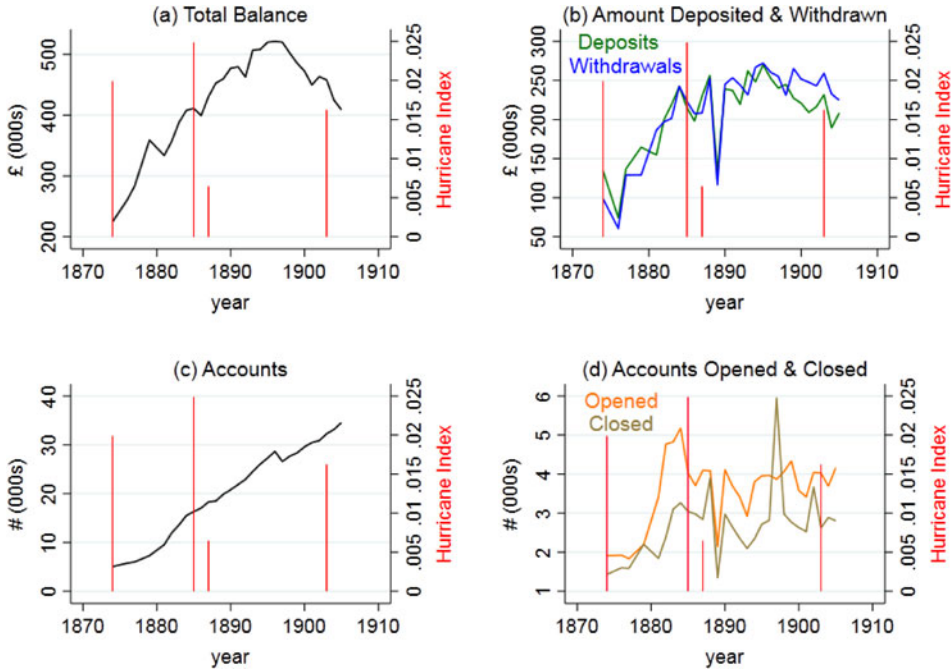


Figure 1. *Aggregate trends in banking components*

Notes: The figure shows trends in total balance, deposits, withdrawals along with the mean parish-level hurricane index for the sample period.

Comparing this to census data in 1871 shows that account holders are substantially over-represented in professional occupations (38.6 percentage points), and somewhat more dominant in commerce. In contrast, the share of agricultural workers is 33.6 percentage points smaller. Commerce workers are also more common among account holders. In contrast, there is little difference in the share held by domestic service workers. Fourteen years later (1889), shares of account holders in industry and construction, domestic services, and commerce increased, while those in agriculture and professional jobs fell. Using the closest available census count data (1891) shows that nationally a fall was also experienced by workers in the agricultural sector, while at the same time industry and construction, commerce, and domestic service sectors increased their role in aggregate employment. In contrast to GSB account holders, however, relative employment in professional occupations rose nationally.

We depict the aggregate trends in the shares of account holders by account amount in Figure 2. As can be seen, the number of account holders with amounts less than or equal to £5 has steadily increased from just under 60 to stand at over 80 per cent by the end of our sample period. This has been at the cost of all other amount categories, although less so for those accounts in the £5 to £10 category. One can put these categories into relative perspective of average annual earnings in Jamaica for the years

Table 1. *Summary statistics*

Variables	Mean	Std. dev.	Min.	Max.
$H (\times \frac{1}{10^7})$	0.22	0.65	0	3.91
$H \neq 0 (\times \frac{1}{10^7})$	1.70	0.85	0.24	3.91
Total balance (000s £)	33.1	60.4	2.3	295.8
Deposits (000s £)	16.2	34.1	9.8	16.7
Withdrawals (000s £)	16.6	34.5	0.8	17.6
Accounts remaining opened	1,628	3,046	99	17,990
Accounts closed	208	428	9	2,939
Accounts opened	281	548	19	3,000
Accounts ( $\leq$ £5)	1150	2,329	30	14,237
Accounts ( $>$ £5 & $\leq$ £10)	121	196	7	1,058
Accounts ( $>$ £10 & $\leq$ £50)	228	344	32	2,248
Accounts ( $>$ £50 & $\leq$ £100)	53	90	1	392
Accounts ( $>$ £100 & $\leq$ £200)	16	30	0	320
Accounts ( $>$ £200)	38	69	0	525
NII Accounts	1,584	3,044	88	17,950
NII Total balance (000s £)	31.6	59.3	1.7	290.1
II Accounts	61	70	0	283
II Total balance (000s £)	1.5	2.0	0	8.3
<i>Main branch</i>				
Deposits (000s £)	15.4	34.3	0.9	17.6
Withdrawals (000s £)	16.0	35.6	0.8	175.5
<i>Sub-branch</i>				
Deposits (000s £)	0.9	0.8	0	3.9
Withdrawals (000s £)	0.8	0.7	0	3.7

Notes: (i) Sample period: 1874–1906; (ii) All monetary values are deflated to 1870 values; (iii) II: Indian immigrant account holders; NII: non-Indian immigrant account holders.

1870, 1890 and 1906, as calculated from Eisner (1951) for predial, trade, domestic service and professional workers. More specifically, for domestic service employees annual average earnings would have been about £12 (1870), £20 (1890) and £20 (1910).<sup>33</sup> Similarly, predial workers, which would have been mostly agricultural labourers (Eisner 1951), were relatively low earners, with average annual earnings of £23 (1870), £36 (1890) and ££27 (1906). Thus for both of these low-wage groups, even savings of £5 would have constituted on average between 14 and 42 per cent of their annual income. If one assumes that annual personal consumption for these workers was no greater, and likely less, than the average per capita personal

<sup>33</sup> We assumed that all workers worked on average six days a week and 52 weeks a year when remuneration amounts were not given as an annual value for any of the four occupational categories.



Table 2. Occupational distribution of GSB account holders and general population

	ALL (1875)	ALL (1889)	PC (1871)	PC (1891)
Agriculture	34.4	26.3	68.0	62.8
Industry & construction	9.3	15.6	16.9	17.2
Commerce	5.8	6.1	2.9	4.0
Professions	40.6	36.8	2.0	2.5
Domestic service	9.9	15.2	10.2	13.5
	II (1875)	II (1889)	NII (1875)	NII (1889)
Agriculture	93.8	90.3	29.1	23.4
Industry & construction	0.0	0.4	10.1	16.3
Commerce	5.2	7.6	5.9	6.1
Professions	0.0	0.6	44.2	38.4
Domestic service	0.9	1.0	10.7	15.9

Notes: (i) ALL: all account holders; PC: population census; II: Indian immigrant account holders; NII: non-Indian immigrant account holders; (ii) Agriculture includes all occupations related to agricultural production and fisheries; Industry & construction includes dressmakers, tailors, shoemakers, butchers, carpenters, blacksmiths, bricklayers, and other occupations related to production of physical goods; Commerce includes merchants, shopkeepers, petty-traders, clerks, transport workers and other related occupations; Professions includes doctors and dentists, lawyers, clergy, public servants, teachers, constabulary, prison and reformatory superintendants, parochial officers, official inspectors and post office engineers, and military and naval staff.

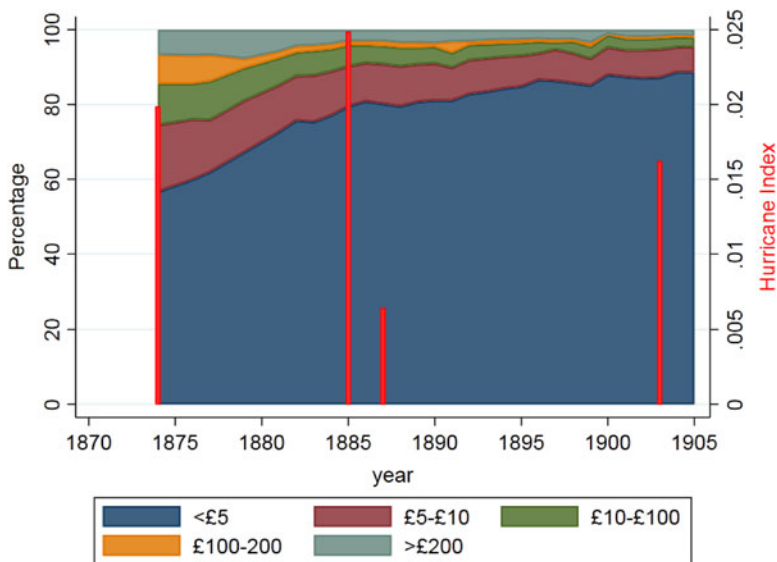


Figure 2. Share of accounts by value of total balance

Notes: The figure shows aggregate trends in the number of accounts by value of the total balance along with the mean parish-level hurricane index for the sample period.

consumption of goods and services in Jamaica during the period 1870 to 1910, i.e. around £11, then accumulating savings up to at least £5 each year would have been mostly achievable. Tradesmen, a category which most likely covers those working in industry, construction and commerce, were substantially higher earners than domestic or predial workers, averaging an income of £62 (1870), £78 (1890) and £62 (1906) per year. Even at their lower rate of earnings and assuming average annual personal consumption it would have taken only five years to accumulate savings of at least £200. For the average professional, with annual earnings ranging from £450 (1870) to £600 (1890 and 1905), the GSB as a facility to earn interest on their possible savings, i.e. on amounts no more than £200, is likely to have been less appealing. Examining the parish summary statistics of the division of account holders by the amount of deposits shows that on average the majority had total deposits less than or equal to £5 (71 per cent), followed by greater than £10 and less than or equal to £50 (14 per cent), greater than £5 and less than or equal to £10 (8 per cent), greater than £50 and less than or equal to £100 (3 per cent), greater than £100 and less than or equal to £200 (2 per cent), and greater than £200 (2 per cent).

Unsurprisingly, given that the number of non-Indian-immigrants (NII) constituted between 90 and 97 per cent of all depositors, their trends in total balance and number of accounts follow closely those of the total sample; see Figure 3. In contrast, the total

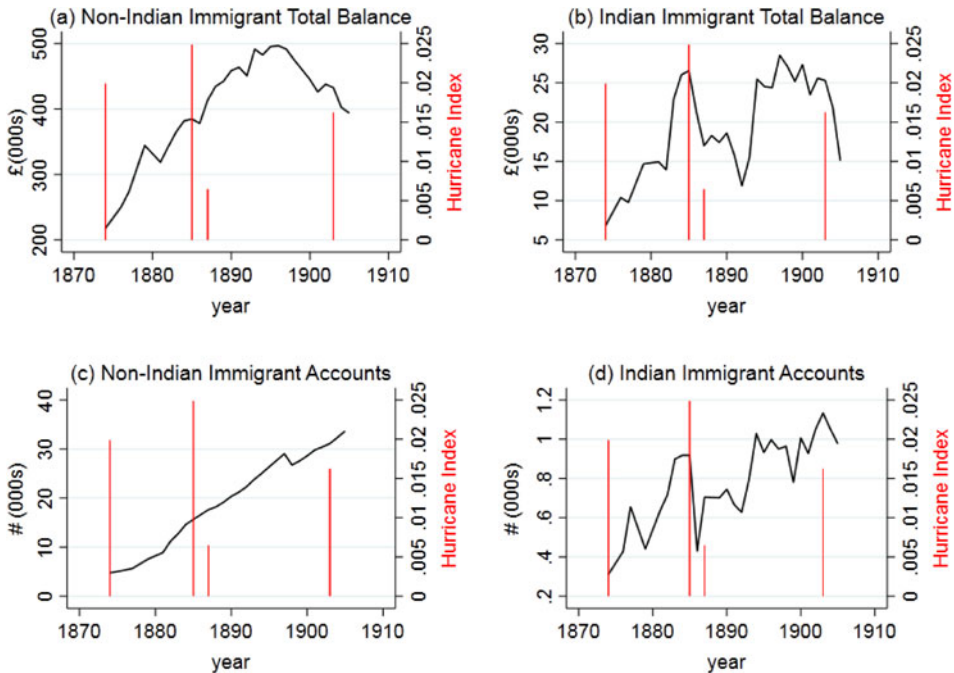


Figure 3. *Non-Indian and Indian immigrant banking components*

Notes: The figure shows trends in Indian and non-Indian immigrant total balance and number of accounts along with the parish-level mean hurricane index for the sample period.

amount of savings attributed to Indian immigrants (II) is much more volatile, experiencing a surge in the late 1870s with the introduction of the Indian immigration programme in 1879. After the mid 1880s, however, there was a stark fall, only to increase again in the mid 1890s. The end of our sample period appears to have been at the beginning of a declining trend. In contrast, while also volatile, the number of II account holders had been on a rising trend throughout our sample period. At the parish level, the average II savings amount is about 2 per cent of the total while their share in numbers is 2.4 per cent, indicating that their per capita savings is lower. Table 2 provides insight into the occupational differences between II and NII account holders. As can be seen, in 1875 nearly 94 per cent of II depositors worked in the agricultural sector, which is not surprising given the intention of the Indian immigration programme to recruit East Indians to work in this sector. Nevertheless, some did work in commerce (5.2 per cent), while a small share (0.9 per cent) were employed in domestic service and none in industry and construction or professional occupations. The II account holders are thus very different in composition from the NIIs, mainly being concentrated in the agricultural sector. By 1889 little had changed for the II, except that the dominance of employment in agriculture marginally dropped to 90.3 per cent, and that there were slightly more working in commerce and a few in industry and construction and professional occupations.

Examining the aggregate trends in the deposits and withdrawals categorized by main and sub-branches in Figure 4 shows that these follow roughly similar patterns, in line with the aggregate figures. The only apparent difference is that for the latter few years of our sample period withdrawals from main branches, although varying, do not seem to be on a decline in contrast to the total balance of the main branches and deposits and withdrawals in the sub-branches. The parish-level summary statistics in Table 1 indicate that the role of sub-branch depositor activity is small, constituting only about 5 per cent of the total.

Table 1 reveals that when damaging storms struck, i.e.  $H \neq 0$ , there was considerable variation of wind exposure across time and space. The highest level of the index (3.91) occurred during the 1903 storm in the parish of Hanover. We have also depicted the average across parish hurricane index in Figure 1. Accordingly, the average destruction differed across the storms, with the storm in 1885 causing the most damage, followed by those in 1874 and 1903. In contrast, the storm of 1887 was considerably weaker in terms of island-wide damaging wind exposure. Eyeballing the correlation with the main banking components would suggest that for the two more damaging storms that occurred after 1874, both deposits and withdrawals appear to have subsequently been falling, parallel with slight net falls in total balance. Similarly, account turnover seems to have dropped after these three storms, although little impact is discernible from the aggregate total number of account holders.

The estimated coefficients on  $\beta_{Ht-j}$  from equation 3 along with their 95 per cent confidence bands, using alternatively parish-level total balance, deposits and withdrawals as the outcome variable, are shown in Figure 5. Accordingly, the total balance falls persistently for up to three years after a hurricane, with implied decreases of

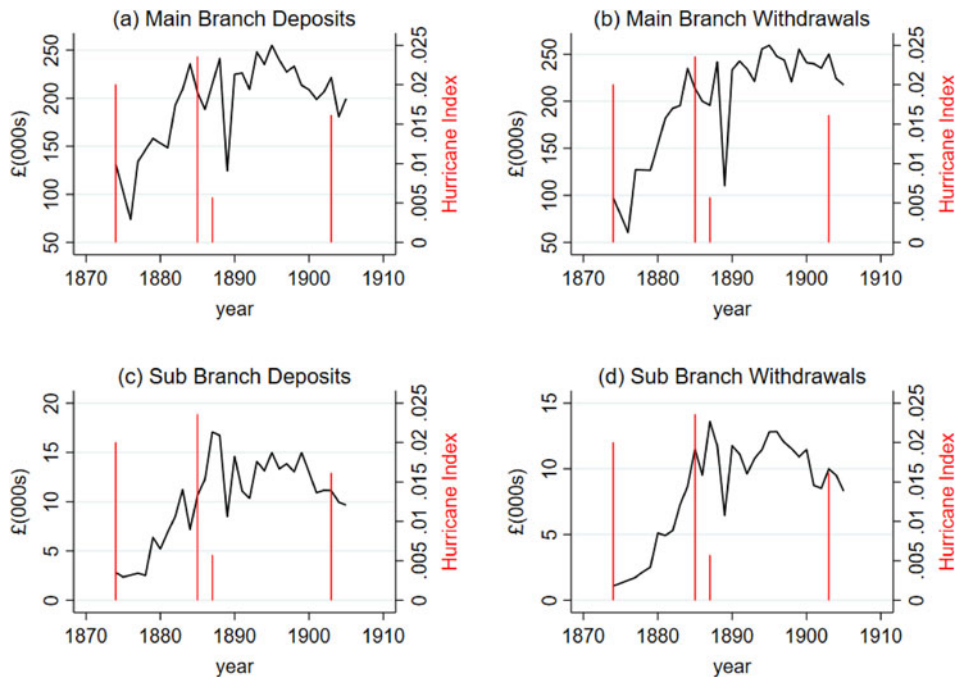


Figure 4. *Main and sub-branches*

Notes: The figure shows trends in Indian and non-Indian immigrant total balance and number of accounts along with the parish-level mean hurricane index for the sample period.

20.4, 23.4 and 23.8 per cent for average (1.70) hurricane wind exposure ( $H \neq 0$ ) over our sample period. A damaging hurricane also causes an initial fall in deposits, as would be expected given that the damage is likely to reduce income and hence potential savings for some account holders, but this does not persist beyond the year of the storm. Taking the coefficient at face value suggests that for the average parish-level damage, deposits are reduced by 18.7 per cent. In contrast, the impact on parish-level withdrawals is larger and persists up to a year after the storm. More importantly, however, it is also negative, where the estimated coefficients suggest that the initial impact is double that of deposits, i.e. 37.4 per cent, for the average level damage, and this then drops to 23.8 per cent. Thus, judging from these base aspects of GSB accounts, there is little evidence of the use of the savings facility as precautionary savings for when the need arises. Rather, the drop in withdrawals is more in line with account holders using the GSB to earn interest on money deposited for possibly non-necessary future expenditure, which they maybe decided not to draw upon after a damaging hurricane.

In terms of the account holder numbers, Figure 6 shows that the net number of accounts falls in the two years after a hurricane. For average wind exposure, this translates into percentage falls of 23.8 and 33.2 per cent of individuals holding accounts,

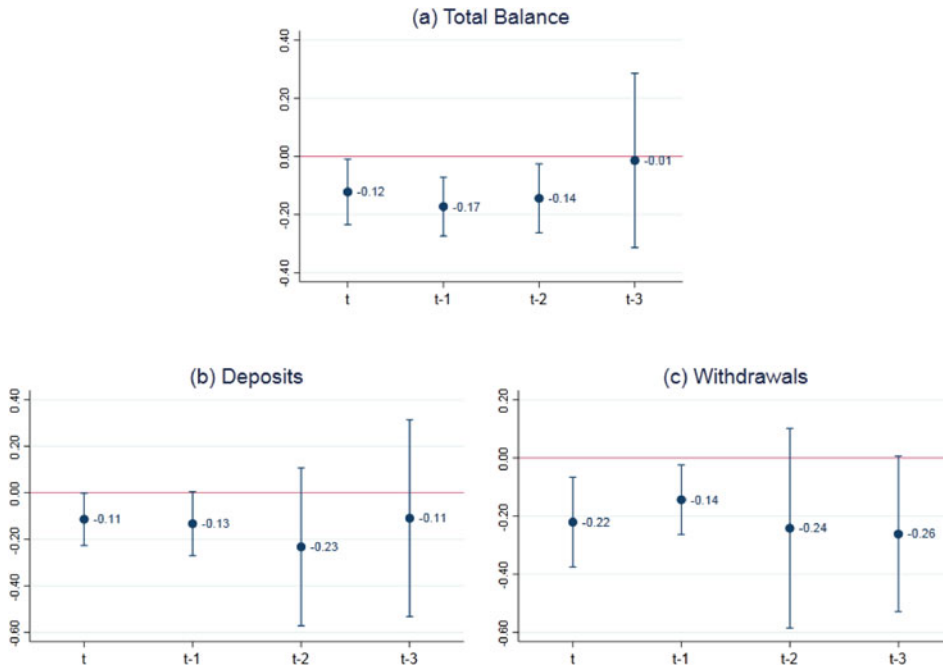


Figure 5. *Impact of hurricanes ( $\beta_{H_{t-j}}$ ) on key banking components*

Notes: (i) Values represent estimated  $\beta_{H_{t-j}}$ ; (ii) Confidence bands are 95 per cent.

respectively. Looking at the turnover driving these net account number effects, one finds that the number of accounts opened fall during the two years after a damaging hurricane, with elasticities of 23.8 and 30.6 per cent. Given that there are likely to be less savings available once a hurricane causes damage to income-generating activities, this may not be surprising. However, at the same time fewer accounts also tend to close after a storm, both in the year of the event as well as between one and three years later, with associated elasticities of 25.5, 27.2 and 44.2 per cent, respectively. In this regard, if precautionary savings was the driving force behind the majority of deposits in the GSB, one would expect that many accounts would have been closed when account holders draw on their savings to buffer income shortages. If saving for non-necessary expenditure often involves the closing of accounts then this result is instead in line with what was found for withdrawals.

Examining possible effects across account amount holders in Figure 7 shows that there are considerable heterogeneous experiences. More specifically, there are no impacts in either the largest ( $>£200$ ) or the smallest ( $\leq£5$ ) accounts. Moving on to the second smallest ( $>£5 \leq £10$ ) and the second largest ( $>£100 \leq £200$ ) groups one finds that both of these are characterized by a drop in numbers in the year after the hurricane, but that these are relatively small, i.e. 23.8 and 17 per cent, respectively. Thus, overall there is little evidence that smaller account holders, which are probably also more likely to be the less wealthy, might have been using their GSB deposits for a

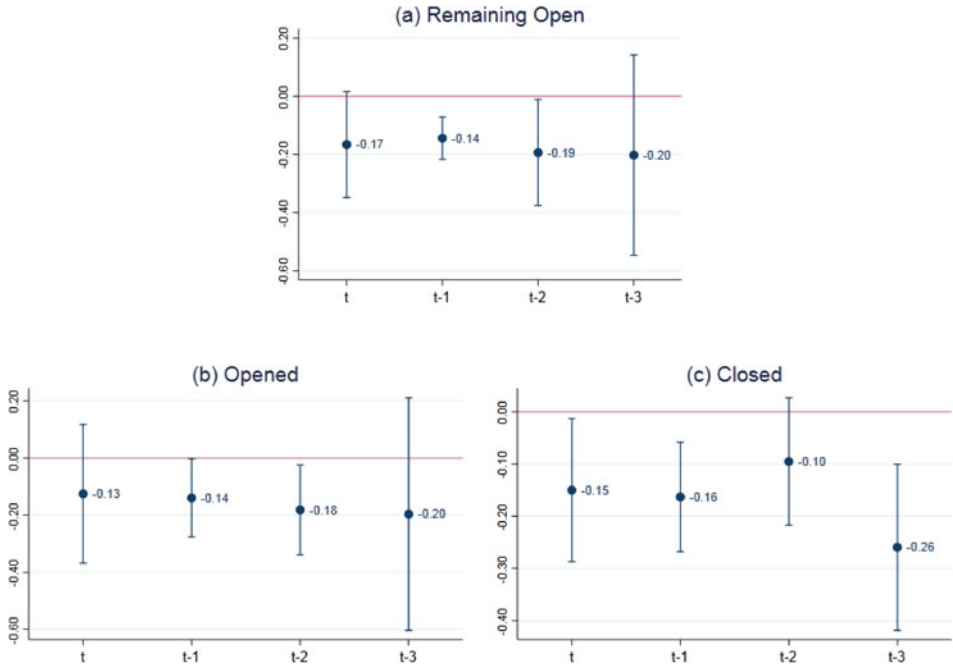


Figure 6. Impact of hurricanes ( $\beta_{H_{t-j}}$ ) on number of account holders  
 Notes: (i) Values represent estimated  $\beta_{H_{t-j}}$ ; (ii) Confidence bands are 95 per cent

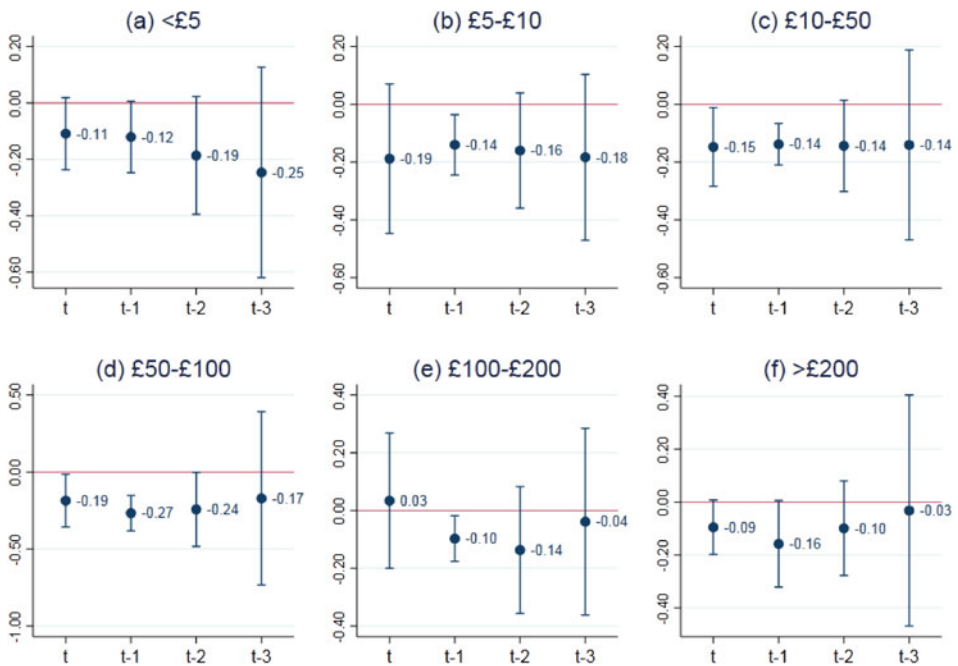


Figure 7. Impact of hurricanes ( $\beta_{H_{t-j}}$ ) on number of account holders by account total balance value  
 Notes: (i) Values represent estimated  $\beta_{H_{t-j}}$ ; (ii) Confidence bands are 95 per cent.

precautionary savings motive. Rather, if individuals were closing their accounts because of greater financial need after a hurricane, it was only the ones with the medium-sized account amounts that did so.

One feature of the GSB depositors that could make it difficult to find evidence for a precautionary savings motive is that, as noted earlier, a non-negligible share of these were Indian immigrants who participated mostly in order to save and then return home after their contract ended. To further investigate this, Figure 8 shows the coefficient estimates for the separate samples of NIIs and IIs for the total balance and the number of account holders. Accordingly, the number of Indian immigrant accounts falls for up to two years after a hurricane, where the coefficients suggest a strong response in the year of the storm (71.4 per cent) and slightly smaller effects in the following year (51.0 per cent). One possible reason could be that the Indian immigrants may have lost their employment if the plantation at which they were working was strongly affected by a hurricane.

In contrast to the IIs, there are much smaller, but more persistent effects for all other account holders in terms of the total balance, as in line with the overall sample. More specifically, the implied elasticities to an average storm are 15.3, 30.6 and 25.5 per cent for  $t$ ,  $t-1$  and  $t-2$ , respectively. However, at the same time the number of account holders of this group only falls slightly in the year after a hurricane, with an elasticity of 23.8 per cent for an average damaging storm. The greater response by II account

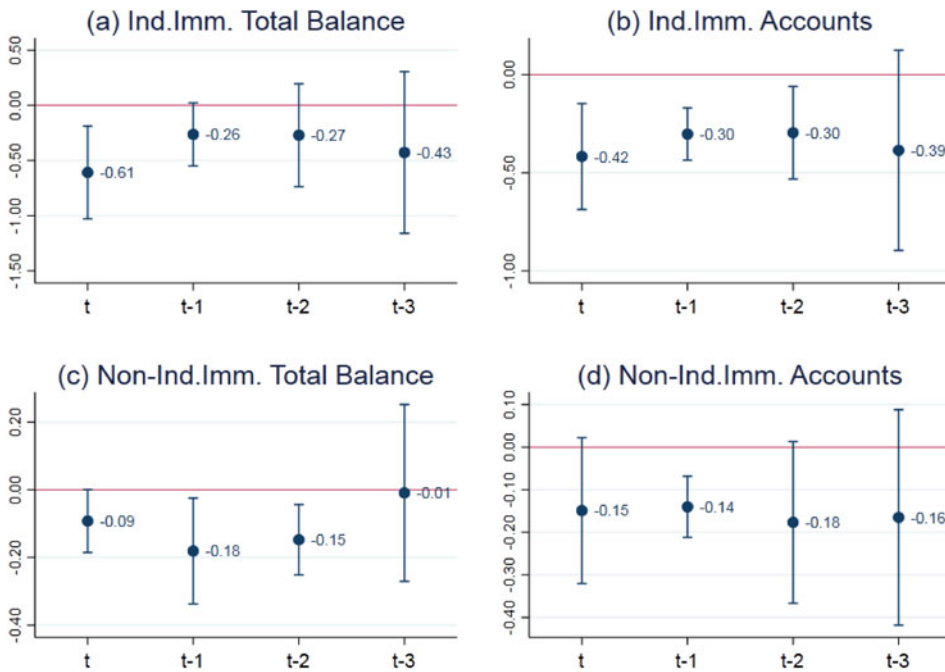


Figure 8. *Impact of hurricanes ( $\beta_{H_{t-j}}$ ) on Indian immigrants and non-Indian immigrants*

Notes: (i) Values represent estimated  $\beta_{H_{t-j}}$ ; (ii) Confidence bands are 95 per cent.

holders may be because these were generally employed in the agricultural sector, which would have been particularly affected by hurricanes (Huesler and Strobl 2023), thus were more likely to lose their employment or suffer a reduction in wages and/or hours than NII, or may even have returned back to India prematurely after such shocks. At any rate, if this was not the case, all else being equal, one would certainly expect less of a precautionary savings motive for II depositors and thus lower effects than for the NII, i.e. in contrast to what our findings here suggest.

Finally, our analysis comparing main branches to sub-branches also indicates some heterogeneities across these account holders. In particular, the sub-branches served rural areas, which tended to constitute a more agricultural and poorer population (Eisner 1951). In contrast, main branches were certainly more easily accessible for the urban population and hence non-agricultural workers, who might have been less affected by hurricanes. In this regard, one finds that at main branches, deposits fall at  $t-1$  with an implied elasticity of 28.9 per cent for an average storm, as shown in Figure 9. Withdrawals at main branches also fall after hurricanes, but their impacts are much more persistent, lasting up to three years after the event, although the coefficient at  $t-2$  is not statistically significant. This is in line with the results for these bank variables for the sample undistinguished by branch type. The implied effects are 34.0, 27.2 and 44.2 per cent, respectively. In contrast to the behaviour at main branches after a damaging storm, there appears to be little effect from account

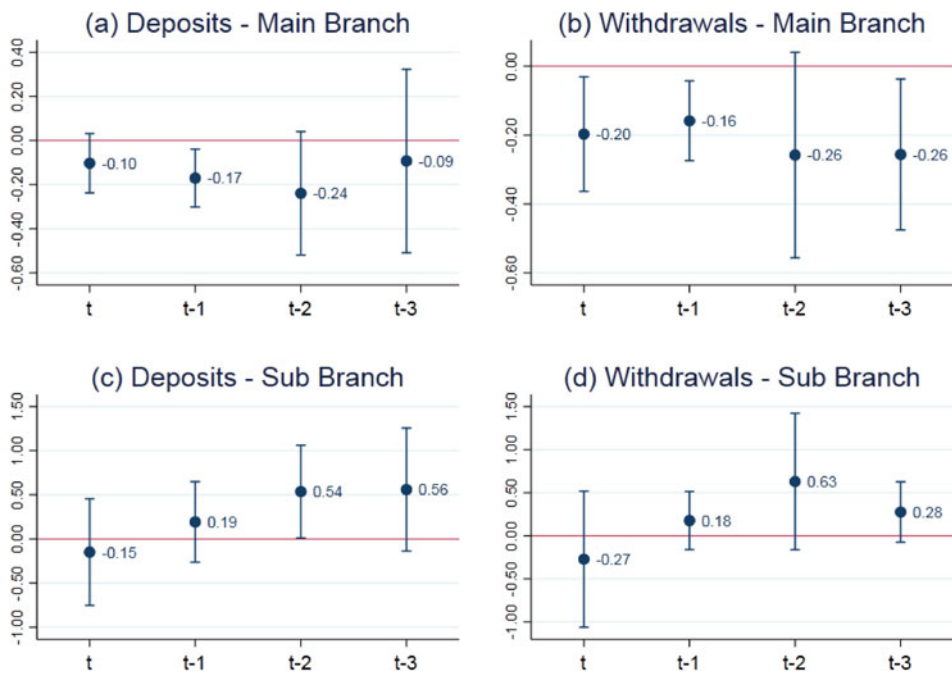


Figure 9. Impact of hurricanes ( $\beta_{H_{t-j}}$ ) on key banking components for main and sub-branches  
Notes: (i) Values represent estimated  $\beta_{H_{t-j}}$ ; (ii) Confidence bands are 95 per cent.



holders at the sub-branches. More precisely, there is no fall in withdrawals, and only a somewhat surprising rise in deposits two years after the event, with an elasticity of 91.8 per cent. Some reasons for this may have been the generally low use of the sub-branches in rural areas, arguably due to lower confidence in these (DR 1871–2), and that their services hours were more restricted. As a matter of fact and as noted earlier, a number of these closed over our sample period due to a lack of activity. Certainly, given that account holders in the rural areas are likely to be small and relatively poorer agricultural settlers (Eisner 1951; Holt 1992), the lack of any effects on the sub-branch account holders is not suggestive of precautionary savings behaviour by the poor.

## V

Our parish-level analysis above provides little evidence that would be consistent with a precautionary savings motive of GSB account holders, raising the question of whether this was simply the Jamaican experience or whether it was typical of savings banks in general.<sup>34</sup> To further explore this, we compare the GSB to the early days of British Trustee Savings Bank (TSB), where the main motive for creation was also to encourage the poor to be thrifty in an environment with essentially no other financial vehicles available for them (Horne 1947).

Unfortunately, the only surviving temporal data available for the TSB are aggregated across all its English, Welsh, Scottish and Irish branches, allowing only an aggregate comparative analysis. More specifically, Horne (1947) compiled the total annual values of deposits and withdrawals of all TSB account holders since 1817, i.e. five years after the creation of its first branch. To create comparable samples for the TSB and the GSB, we digitized these data for the period 1817 to 1849, as well as aggregating total GSB withdrawals and deposits for our sample period (1874 to 1906). To investigate whether TSB and GSB account holders' behaviour in aggregate are consistent with the precautionary savings motive, we would ideally like to see the response to some comparable measure of aggregate economic shocks. Unfortunately, unlike for Great Britain, there are no available data on annual GDP for Jamaica. We thus instead use government revenue from taxes, as has been employed by Huesler and Strobl (2024b) as a proxy of economic activity for Jamaica, and use its growth rate in order to capture changes in aggregate economic conditions. The compiled information provides us with temporal data on the growth rate of tax revenue and savings banks' total deposits and withdrawals for both the Jamaican and British contexts, where all series were deflated to their real values.<sup>35</sup>

<sup>34</sup> As noted in Section I, there has not been another explicit test of the precautionary savings motive for savings banks in other contexts as of date, although both evidence from Maltby *et al.* (2013) and Alter *et al.* (1994) suggest that it might not have been important.

<sup>35</sup> Data on British government tax revenue and CPI deflator were taken from Thomas and Dimsdale (2017), while total tax revenue was compiled from Huesler and Strobl (2024b)

Table 3. *Comparative impact of income shocks on deposits and withdrawals*

	Great Britain	Jamaica
DEPOSITS:		
$\Delta \log(\text{REVENUE}_{t-1 \rightarrow t})$	-0.329 (1.123)	0.514 (0.900)
$\Delta \log(\text{REVENUE}_{t-1 \rightarrow t-2})$	2.494* (1.116)	-0.892 (0.822)
$\Delta \log(\text{REVENUE}_{t-2 \rightarrow t-3})$	1.999 (1.087)	-0.873 (0.914)
Observations	31	31
$R^2$	0.250	0.10
WITHDRAWALS:		
$\Delta \log(\text{REVENUE}_{t-1 \rightarrow t})$	-0.724 (2.848)	0.322 (1.106)
$\Delta \log(\text{REVENUE}_{t-1 \rightarrow t-2})$	-5.798* (2.829)	-0.720 (1.010)
$\Delta \log(\text{REVENUE}_{t-2 \rightarrow t-3})$	-2.393 (2.755)	-0.6387 (1.122)
Observations	31	31
$R^2$	0.168	0.038

Notes: (i) Standard errors in parentheses; (ii) \* indicates 5% significance level; (iii) Deposits and Withdrawals are converted to their inverse hyperbolic sine values.

To conduct a rough test of the existence of a precautionary motive as can be gauged from the aggregate data, we regressed alternatively total savings banks' deposits and withdrawals on the growth rate of government tax revenues, allowing for lagged effects of up to two years. The results of these regressions are given in Table 3. As can be seen, for Great Britain better (worse) economic conditions, as measured by government tax revenue, led to an increase (decrease) in deposits a year later, while at the same time decreasing (increasing) withdrawals. In contrast, for Jamaica windfalls in tax receipts did not lead to an effect on either savings bank deposits or withdrawals. Thus, while the aggregate behaviour of TSB account holders in response to economic conditions is consistent with the precautionary savings motive, we find no such aggregate evidence for the GSB.

## VI

Following the emancipation of slaves, the Jamaican colonial government created the Government Savings Bank of Jamaica (GSB) to encourage the poor to save some of their monetary earnings for times of need. As such, the GSB has been viewed as having been largely successful after its restructuring in the late 1806s, both by observers at the time and subsequently by researchers. Using a parish-level 30-year data set of

depositor behaviour and damages due to hurricanes as an income shock proxy, we investigated here whether this was indeed the case. However, our results suggest otherwise. More specifically, while we do find that the net total balance, deposits and the net number of account holders at the GSB decreased after hurricane shocks, at the same time the number of withdrawals and the number of accounts closed also decreased. Arguably, the latter is incongruent with a precautionary motive for people depositing their savings at the GSB, and rather more in line with individuals using their accounts for possibly non-necessary expected future expenditure, which they decided to not draw upon after the income shock. Additionally, our findings show that the fall in the number of accounts is not due to those with the smallest savings, and thus those likely to be the poorest and who would have been more in need of precautionary savings. Similarly, depositors in rural areas, most likely represented by poorer small agricultural settlers, do not seem to be affected at all by hurricanes, although this may have to do with the possibility that there was less confidence in rural branches and that these offered less flexible opening hours. Finally, the net total balance and number of Indian immigrant account holders responded to hurricanes in a qualitatively similar way to other depositors, but quantitatively to a greater degree. While the latter may have been because Indian immigrants were much more likely to be employed in a sector relatively more affected by hurricanes (agriculture), one probably would have expected Indian immigrants to have used the GSB less for precautionary savings since the intention of most of them would have been to save money for their return home.

One should note that the interpretation of our results rests on the assumption that hurricanes mainly affected the behaviour of GSB clientele as a direct income shock. However, hurricanes may also have impeded account holders from gaining access to branches by damaging infrastructure, even if they wanted to withdraw their savings to buffer the shock. Indeed, as documented by Huesler and Strobl (2024b), excessive flooding, some of which was due to hurricanes, caused considerable damage to both roads and railways and temporarily impeded their use. Nevertheless, Huesler and Strobl (2024b) also show that such transportation infrastructure damage also constituted a local income shock by temporarily restricting market access. Another mechanism through which hurricanes might have impeded GSB account holder activity could have been by damaging the nearest branch; there is, however, no mention of any branch being damaged after a hurricane in any of the annual GSB reports. Moreover, starting in 1881 account holders were able to conduct their account activity by telegram or post if needed, so that at least after this point in time branch damage might not have been a particularly important obstacle for account deposits or withdrawals.

Although overall we find little evidence of the GSB acting as precautionary savings vehicle for the poor in Jamaica, we need to emphasize that the GSB should nevertheless not necessarily be seen as ineffective. Rather, it arguably provided the sole institution for small savers in that at the time, the only other banking entities were the dominant Colonial Bank and a few Canadian commercial banks, all of which served bigger clients involved in agriculture and trade (Callender1965). Moreover,

other local financial institutions offering loans to particularly small farmers, such as the People's Cooperative Bank and the Agricultural Loan Society, only came into existence in 1905 and 1912, respectively. Within this context, the rise in the number of accounts over our sample period certainly attests to the general use of and confidence in the GSB as a savings institution.

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