

Labor Compensation in the Portuguese and Dutch Merchant Empires

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Abstract

The different organizational structure of the Portuguese and Dutch merchant empires affected their ability to monitor workers. I test the theoretical implications of these differences using micro data of overseas workers' compensation from the sixteenth to the eighteenth century. The two merchant empires used significantly different compensation structures: working for the king of Portugal corresponded on average to a bonus-wage ratio two-thirds higher than that of the Dutch East India Company. These results are consistent with theoretical implications and provide additional support to the historical evidence we have on the organizational structure of merchant empires.

KEYWORDS: Merchant Empires, Labor Compensation, Monitoring

Since the beginning of the European overseas expansion in the fifteenth century, attracting individuals to risky ultramarine ventures was a major challenge for those in charge of long-distance trade. Regardless of the party in control, king and merchants faced the classic agency problem: how to motivate employees to work hard in distant locations where they could not only shirk, but also engage in other activities that reduced the venture's returns (e.g. smuggling). When monitoring is costly, managers can induce workers' effort by linking compensation to performance, such as with the use of bonuses. However, when monitoring is free, managers retain a larger surplus of production by paying fixed wages.

This paper presents evidence on the different structure of labor compensation between Portuguese and Dutch overseas workers from the sixteenth to the eighteenth century. This evidence provides additional support to the theory explaining the emergence of different organizational structures of merchant empires presented in Rei (2009): differences in the distribution of endowments between the king and the merchants implied different structures in the organization of trading companies – Portugal's king remained the residual claimant of the enterprise, whereas in the Netherlands control was delegated to the merchants. As a result, the merchant controlled company in the Netherlands would have had a better information structure relative to the crown controlled enterprise in Portugal. These differences have stark theoretical implications.

I propose a standard Principal-Agent model to explain such implications. Better information on shirking workers led to contracts offering flat wage and low bonus. Richer information structures were more expensive, and such investment might not have been optimal, in which case contracts would offer low wages and high bonuses. I test these implications using archival data on the labor compensation of Portuguese and Dutch workers overseas from the sixteenth to the eighteenth centuries.

The results show significant differences between these two groups of workers. On average Portuguese royal employees received a larger portion of their compensation in the form of bonuses rather than wages, when compared to the workers of the Dutch East India Company

(Verenigde Oost-Indische Compagnie – VOC), even after controlling for workers’ location, sector, and rank.

Even though there is no direct evidence on the quality of workers’ monitoring in merchant empires, these results support Rei (2009) as the quality of monitoring can be proxied by the type of organizational form. In that sense monitoring is exogenous in the context of this paper, because it is determined by the choice of organizational form. The model explains the differences in the structure of labor compensation *conditional* on the (king or merchant) control structure; it does not explain the choice of monitoring levels. Compensation schemes are chosen optimally given the principal’s monitoring ability: larger bonuses are offered when monitoring is hard, as opposed to larger wages when monitoring is easy.

Incentives to induce workers’ effort, both in terms of bonuses and wages, have been subject of a lengthy theoretical literature:¹ the use of bonus payments as non-linear compensation schemes has been analyzed with regards to the use of performance standards (Murphy 1999, Murphy and Oyer 2001); wages on the other hand, have been subject of study in as different contexts as deferred compensation or efficiency wages (Shapiro and Stiglitz 1984 and Salop and Salop 1976).

The empirical work across the fields of organization and personnel economics is quite thin. Krueger (1991) estimates the differences in compensation between company-owned and franchise-owned firms, which suggest that monitoring affects the compensation structure. Hejeebu (2005) does not focus on alternative organizational forms, but rather addresses the complementarity of private trade and labor compensation to deal with the moral hazard problem in the British East India Company, suggesting yet alternative ways to deal with monitoring difficulties. Finally, Carlos (1992) examines the contract structure by the Hudson’s Bay Company and the Royal African Company in order to deal with the problems of moral hazard and adverse selection associated with long-distance trade.

In this paper I look not at bonuses or wages per se, rather I provide a model to explain

¹For an overview of the general literature see Lazear 1995, Gibbons 1996, Prendergast 1999.

their relative size. The model illuminates the historical evidence we have on the compensation of overseas workers in merchant empires.

1 Historical Background

The sixteenth and seventeenth centuries saw the establishment of direct trade connections between Europe and the East.

All merchant empires hired workers in Europe and sent them off to the East in perilous vessels where the probability of dying, either from shipwreck or disease, was non-negligible.² In addition, the Eastern destinations of these workers were often stricken by military conflict either with local rulers, or with competing empires. The compensation package offered to these workers had to provide a premium that accounted for overseas location, workers' skill, and risk faced. Moreover, incentives had to be in place in order to hire trustworthy workers who would effectively run the empire on the spot, whereas the owner of the monopoly (king or merchant) stayed safe in Europe.

Though all empires engaged in the spice trade, they organized trade very differently, which may have had an impact on the type of compensation package offered to these workers.

Portugal's merchant empire was established as a crown monopoly. The king purchased the ships necessary for the ocean transportation of the merchandise, he paid the men sailing in them, and he was the ultimate residual claimant of the profits of the enterprise. In the East the Portuguese empire was rooted in three basic pillars: the all-sea-route to India, diplomatic agreements with local kings from the eastern coast of Africa to the Spice Islands, and the establishment of fortresses in strategic geographical locations along the way and in the East Indies (Boxer 1969). The ultimate goal was to control all the spice trade in the Indian Ocean by exacting taxes on all ships, thereby blocking the Levant trade and becoming the unique middleman between Europe and Asia in an extremely profitable business.³

²For example, in Vasco Da Gama's 1498 voyage to India about two-thirds of the original crew succumbed to scurvy (Sanceau 1967).

³The net profit rate on pepper imported to Lisbon was between 89 to 152 percent in 1558 (Phillips 1990).

The Dutch had a similar trade policy in the East to the Portuguese: they exerted territorial control through agreements with local rulers establishing trade exclusivity, and also destroyed spice surpluses to enable price control (Hamilton 1948, Morris 1904). In other aspects however, the Dutch had a very different approach: the VOC was a chartered monopoly, belonging to a group of private merchants. The government had no direct involvement in Eastern trade other than the natural return on customs duties and the payments at every renewal of the company's charter, nor was the government able to influence the administration of the enterprise. The residual claimants of the VOC were in fact the merchants who had autonomy over business decisions, such as the design of the labor contracts.

Another noteworthy difference had to do with religion. The Portuguese had trade interests in the empire but they were also fervent converters of souls, whereas the Dutch did not share the latter objective, possibly because they had no king controlling the enterprise, in which case religion was not really the differentiating factor – organization was.⁴ But even if religion were a pertinent difference across merchant empires, it is unlikely that it could have been related with the compensation structure.

Perhaps more relevant is the emergence of the Portuguese and Dutch companies more than one hundred years apart: 1498 and 1602, respectively. In the mean time the Dutch could have invented better monitoring techniques which would affect the type of compensation package offered. Though this alternative is hard to dismiss, it is equally hard to imagine such radical innovation in pre-industrial times when communication between continents was still slow and the difficulties of hiring trustworthy workers still subsided.

Despite the different timing Portugal and the Netherlands faced comparable challenges with respect to the compensation of overseas workers in which the type of organization could

Although pepper was the staple traded spice, others (cinnamon, cloves, nutmeg and ginger) could achieve even higher profit rates.

⁴The case of England is perhaps more striking. Similar to the VOC, the English East India Company was controlled by the merchants and never exhibited any religious interest. We know however that the English crown founded its own religion in the sixteenth century, and prosecuted those who were still followers of Rome. It would therefore not be surprising to see the same interest in religion in the English empire had the English monarch been in charge of Eastern trade. This fascinating topic, however, is not addressed in this paper.

have had relevant implications. The next section offers a model to explain the link between organization and the personnel economics of merchant empires.

2 A Model of Labor Compensation

There are two parties: (1) Principal, the manager of the venture, who works in a company either controlled by the king or the merchants. Among other tasks, the principal is in charge of designing labor contracts that induce workers' effort, and is risk neutral in income; and (2) Agent, the worker hired in Europe to work in Asia, who is risk averse in income, and has preferences $u(w) - a$ with $u' > 0$, $u'' < 0$.⁵

The agent can either shirk or work $a = \{0, 1\}$. Either action is unobservable by the principal (located in Europe), who delegates monitoring in exchange for a signal indicating if the worker is diligent (σ_1) or not (σ_0).⁶ Better monitoring costs more.

The principal prefers an agent who works ($a = 1$), whereas the agent prefers to shirk ($a = 0$). The distribution of signal values depends on the agent's effort choice: if $a = 1$ ($a = 0$), σ_1 arrives with probability p ($q < p$) and σ_0 with probability $1 - p$ ($1 - q$). The informativeness of the signal, or the easiness of monitoring, is given by $\Delta = p - q$; the larger the Δ , the more informative (and also costly, in terms of monitoring) the signal, and the easier it is to monitor workers. The principal ties the agent's payoff to the observed signal: w_1 if σ_1 , and w_0 if σ_0 .

Conditional on the information structure Δ , the principal minimizes the expected labor

⁵I do not consider locally hired workers for several reasons: very likely these workers would be hired for low skilled and/or temporary occupations (e.g. loading ships), easier to monitor; workers hired in Asia to work in Asia would be monitored (and paid) by whoever hired them in Asia and would have less of a moral hazard problem. Such workers are not observed in the data.

⁶In the standard principal-agent model profit is a possible measure of performance to which the Principal may tie the Agent's payoff. In this paper I separate profitability from the information structure, hence the signal notation. The results do not depend on this specification.

compensation cost subject to the incentive and participation constraints of the agent:

$$\begin{aligned} & \underset{w_1, w_0}{\text{Min}} E[w|a = 1, \Delta] \\ & \text{s.t. } pu(w_1) + (1 - p)u(w_0) - 1 \geq qu(w_1) + (1 - q)u(w_0) \\ & \quad pu(w_1) + (1 - p)u(w_0) - 1 \geq \underline{u} \end{aligned}$$

The (binding) incentive constraint can be rewritten as

$$u(w_1) = \frac{1}{\Delta} + u(w_0)$$

which indicates that the less informative the signal, the larger the payoff dispersion. In the two-state model the contract is determined entirely by the two constraints, both of which bind. The result is:

$$u(w_0) = \underline{u} + 1 - \frac{p}{\Delta} \text{ and } u(w_1) = \underline{u} + 1 + \frac{1 - p}{\Delta}.$$

Poor monitoring (low Δ) increases the gap between payoffs associated with of good (w_1) and bad signals (w_0). We can interpret w_1 as a wage, and $w_1 - w_0$ as a bonus. The bonus-wage ratio is then

$$\frac{w_1 - w_0}{w_0} = \frac{v(\underline{u} + 1 + \frac{1-p}{\Delta})}{v(\underline{u} + 1 - \frac{p}{\Delta})} - 1, \text{ where } v(\cdot) = u^{-1}(\cdot).$$

Since $v(\cdot)$ is increasing, the bonus-wage ratio falls in Δ .

The predictions of the model are straightforward: better information leads to less reliance on bonuses. Lower bonus-wage ratios imply lower expected compensation. Thus, while high values of Δ generate higher profits, they are also more costly. In the less efficient organization, the principal earns a lower return from every investment, including monitoring, and therefore there is less of it, this in turn will lead to the design of a labor contract with greater use of bonuses relative to wages, an implication that can be tested in the data.

3 Data

The Portuguese data were extracted from an original manuscript written ca. 1582 (Luz 1960). The Portuguese loss of independence to Spain in 1580 effectively merged the Iberian Eastern and Western empires overseas, which until then had remained under separate administrations. The original author of the document remains anonymous, but Luz speculates he must have been a former Portuguese high secretary of state. The document is addressed to the Spanish monarch with the purpose of providing information about the conditions of the newly acquired eastern empire. In this sense, the data cannot be taken as a single point in time but as a summary of almost one hundred years of Portuguese operations in the East.

The document is divided in seventeen chapters that provide a detailed description of the Portuguese network of strongholds in the Indian Ocean from Mozambique in East Africa, to Ternate in the Southeastern Archipelago (now Indonesia), and also Macao in China.⁷

A typical chapter starts with the description of the location (town or fortress), its geographic characteristics (peninsula, island, mountains or plains), its local rulers (usually vassals of the Portuguese crown), sometimes the type of buildings and the characteristics of local inhabitants. The author then goes in detail over the type of products traded (or produced) in each location as well as the list of all job occupations and respective compensations provided by the king of Portugal.

Labor compensation is composed of two parts: a yearly fixed *wage* paid by the Royal Treasury, and a variable *bonus* in the form of imports (spices), accrued by each worker over three years – the term of the contract.⁸ The bonus varied with worker’s rank, effort, and the location’s trade conditions (e.g. war, good agricultural year).⁹

There is a total of 198 observations, corresponding to overseas job posts of Portuguese

⁷See Figure 3 for a detailed map of the Portuguese controlled cities in the Indian Ocean.

⁸Workers could have been rehired at the end of the three-year contract. The author is silent on this matter.

⁹The author is explicit about this. Many a time, it is mentioned that a given post accrued a certain value of bonus in the past, but that was no longer the case around 1582 because of war, or because the worker was not diligent enough.

workers, all of which provided by the monarch in Portugal and paid by the Royal Treasury.¹⁰

The Dutch data were collected from Lequin (1982), which provides a detailed historical study of the personnel of the VOC. The appendix of this volume shares a wide range of information concerning the VOC's administration. Among the collection, Lequin provides the complete career records of 115 VOC workers who spent some time of their careers in Bengal between 1669 and 1799, a year before the formal dissolution of the company.

From the year of entry to that of exit, the following worker information is reported: name, place of birth, date of entry, chamber of origin within the company, civil status (when known), age at entry (when known), location and corresponding date, occupation and corresponding monthly wage, date of promotion, motive for exit, total career payments in wages (used as *wages* in the Dutch package), total career remittances to the family in Netherlands, and total career payments in kind in the form of exports. I interpret these last two items as the *bonus* in the Dutch compensation package.¹¹

Like the Portuguese, all Dutch workers in the sample were hired in their home country. Of the 115 observed workers, 7 were born in Asia but their first and last names are European. I therefore assume that they were descendants of VOC workers and not locally hired labor for low skilled occupations, which makes the two data sets comparable. The Dutch data set focuses on individuals, allowing for a long run analysis of the careers in the VOC over more than a century. The Portuguese data set, on the other hand, does not provide as much detail since it focuses on job posts. In terms of compensation structure I can, however, analyze both cases through the same lens as I have information on career *wages* and *bonuses* for both.

The dates of the two data sets, while not coincident, are comparable, both starting when the two empires are already well established in the East.

¹⁰The Portuguese administration in the East certainly had local employees in the most various tasks, but those jobs are not in the data.

¹¹Payments in kind in the Dutch package are similar to the Portuguese imports of spices. The remittances may not be compensation above wage, but interpreting them as bonuses only overstates the Dutch bonus-wage ratio, which is not "helping" the model.

Table 1 shows the bonus-wage ratios in the Portuguese and Dutch firms.¹² Even though there are workers earning zero bonuses in both samples, average ratios are larger than 1 indicating that both compensation structures relied more on bonuses than on wages, which is not surprising given the typical moral hazard scenario: it was in the principal's best interest to tie workers' compensation to the outcome of the enterprise in the form of bonus.

The striking fact, however, is the difference in the magnitudes of the ratios: the Portuguese average is almost three times the Dutch counterpart in absolute terms.¹³ Also noteworthy, is the comparison between averages and medians: the Dutch almost coincide, whereas the Portuguese are very far apart, indicating a more dispersed distribution, which is also visible in the larger standard deviation. This preliminary evidence is consistent with the model's predictions that the king controlled enterprise (Portugal) is associated with a poor information structure, which in turn generates high bonus-wage ratios.

In the event Portuguese workers were re-hired after the three year term of the contract there can be three possible scenarios regarding the bonus-wage ratio: (a) it is equal to that of the first contract, in which case the proportion is constant throughout the career; (b) it is higher than the ratio of the first contract in which case the career bonus-wage ratio for Portuguese workers is actually higher than the reported on Table 1; (c) it is lower than the ratio of the first contract, which seems implausible – if a worker were to be re-hired after the first three years he would likely be a good worker, therefore there would be no reason to penalize him. In the plausible scenarios of (a) and (b) the relationship between Portuguese and Dutch ratios reported on Table 1 remains intact.

The data allow for a more complete analysis of the compensation structure, as detailed information on worker's *location*, *sector* (explicitly stated in both documents), and *rank* is available. These variables could be affecting the structure of labor compensation in the following ways: (1) *Location*: workers in spice-producing regions, such as Indonesia, may

¹²The bonus-wage ratio is a convenient variable to analyze because it abstracts from the different monetary units in the two samples.

¹³The Portuguese and Dutch averages are statistically different from each other.

have been easier to monitor than workers located in administrative regions, such as Goa and Bengal in India as their productivity could have been more easily assessed. To account for these differences, I divided locations into India, Indonesia and Other Locations; (2) *Industry*: workers in the civil sector, may be easier to monitor than workers in the sea or military sectors, therefore I divided occupations into sectors of activity – Civil, Sea, Military and Other sectors. (3) *Rank*: high rank jobs may be harder to monitor and offer higher bonuses on average, so I constructed two variables concerning the rank of each job post based on the hierarchical ladder of each firm, provided in each document: from the middle of the hierarchy up I classified the position as high rank, otherwise as low rank.

Descriptive statistics are presented in Table 2. The Portuguese document provides a survey of job posts, therefore the descriptive statistics are extracted directly from the data. In the Dutch case this required some treatment. Since the Dutch data set represents complete career paths, the statistics reported in Table 2 show workers’ Location, Sector, and Rank for each worker in more than 50% of his career.¹⁴ The majority of the observations are located in India, though this is driven mainly by Portuguese workers. Both countries have a large majority of workers in the civil sector, and have 64% of the workers in a low rank job.

4 Results

Consider the following hedonic regression for worker j

$$\frac{b_j}{w_j} = \beta_0 + \beta_1 L_j + \beta_2 S_j + \beta_3 R_j + \beta_4 Org_j + \varepsilon_j,$$

¹⁴Starting and finishing variables vary considerably: most Dutch workers arrived in Batavia – Indonesia – and finished their careers in Bengal – India; most workers (64%) started in the civil sector, but almost all others transferred to this sector at some point in their careers and a total of 97% are last observed in the civil sector. Career progress in the VOC was very clear: 90% of the workers started in low rank positions but only 36% are last observed as such, and about half of those died on the job, and could have progressed further in their careers. These differences do not change the results.

in which the left-hand side represents the bonus-wage ratio of worker j , L_j represents the location of worker j , S_j represents the sector or industry in which worker j is employed, R_j represents worker j 's rank, Org_j the organization employing worker j , and ε_j the error term.

Given the tendencies in Table 1 we would expect a positive correlation between the bonus-wage ratio and an organization controlled by the crown. Given hypotheses (1), (2) and (3) above we would expect $\beta_1 < 0$, $\beta_2 < 0$ and $\beta_3 > 0$.

There are eighty-one workers with zero bonus (fifty-six Portuguese and twenty-five Dutch), which makes the dependent variable zero. A standard linear model would weight these zeros as any other positive observation and would give negative fitted values, but $\frac{b_j}{w_j}$ can never be negative. The results reported on Table 3 use a Tobit model to take care of this problem. Column (1) shows *Indonesia* with an insignificant coefficient, whereas *Civil* is significant of negative sign, which confirms the *Industry* hypothesis but not the *Location* hypothesis above. The Industry coefficient however, is not significant once *Rank* and *Organization* are controlled for (columns 2 and 3 respectively). Low rank workers seem to receive on average lower bonus-wage ratios, confirming hypothesis (c) above.

Organization is the variable of interest in the analysis. *Portugal* is positive and highly significant, even after controlling for other variables that may have been affecting the bonus-wage ratio. Long-distance trade organized under Crown monopoly did have an effect on the way overseas workers were paid: working for the Portuguese king meant, on average, a bonus-wage ratio two-thirds (1.662 times) higher relative to the VOC. Column (4) reports the Tobit results for the log of bonus-wage ratio. Again the variable is significant and the effect is magnified: on average a Portuguese worker receives a bonus-wage ratio that is 2.930 ($= e^{1.075}$) times higher than that of a Dutch worker. The problem with the analysis of $\log(b/w)$ is that there are thirty-nine Portuguese workers with zero wage that drop out of the sample, which reinforces the model's claim that Portuguese workers receive low wages. If however we replicate the analysis using the bonus shares in total compensation (column 5) for all 313 workers, we see that a Portuguese worker gets on average, a 14% higher bonus

share than that of a Dutch worker, which shows that the previous results are not driven by outliers. In all cases the coefficient for *Portugal* has the expected sign and is very significant, indicating that organization is related to the type of labor compensation offered.¹⁵

Even though the information is comparable on both data sets, Portuguese data are expected compensation as established in the three-year term contract, whereas the Dutch data are realized compensation values throughout the worker's career, which lasted twenty-two years on average. It is plausible to argue that both organizations had the same contractual arrangements, but that the Dutch outcomes are distorted because Portuguese workers are assumed to have completed their contract, whereas Dutch workers may not have.

Table 4 shows the reasons for Dutch workers exiting the sample. Assuming that workers departing the East or arriving the Netherlands completed their contract, 70% of the workers have incomplete career paths, which may distort the observed bonus-wage ratio of the Dutch empire. If the VOC's personnel policy was one in which age-earnings profiles paid less than the value of marginal productivity for young workers and more for old workers (Lazear 1981), and if bonuses are seen as a reward to be achieved later in the career, then the observed Dutch bonuses are smaller than what VOC workers could achieve had they all completed their contracts. To address this problem I look at the overall distribution of the Portuguese and Dutch bonus-wage ratios on Figure 1.

Panel A shows the distribution of the bonus-wage ratios for all Portuguese and Dutch workers. The Portuguese distribution lies to the right of the Dutch distribution indicating a structure of compensation relying more on bonuses. Panel B shows the bonus-wage ratio for all Portuguese workers, and for Dutch workers that returned to the Netherlands or departed from the East, that is, Dutch workers with complete contracts. We can see that the previous tendency is reinforced: Dutch workers with complete contracts receive lower bonus-wage

¹⁵For further investigation on whether the differences in the compensation structure are accounted by the ease of monitoring I also estimated separate tobits using Portuguese and Dutch data. Results show that the estimated coefficients are jointly significantly different. A decomposition of the average bonus shares shows that the observable country differences explain only 13% of the gap, leaving 87% to differences in the estimated coefficients.

ratios than Portuguese workers.

The comparison of the Dutch distributions for complete and incomplete contracts on Figure 2 seems to either disprove the Lazear thesis, or the hypothesis that bonuses are late career rewards, or both, as Dutch workers with complete contracts are the ones getting lower bonus-wage ratios in the overall distribution.

The concern is now one of selection. It may be the case that Dutch workers who reach the term of the contract are of lower ability and either never reach a high rank occupation, or self-select into sectors of activity that are easier to monitor and therefore receive lower bonus-wage ratios. To account for a possible influence of contract completeness on the bonus-wage ratio I include a corresponding dummy variable on the right hand side of the Tobit estimation while controlling for all other available variables.¹⁶

Column (1) on Table 5 shows the Tobit results just for Dutch workers. The bonus-wage ratio does not seem to be affected by complete contracts, which turns out to be statistically insignificant. Column (2) reports the results for all Portuguese and Dutch workers with positive bonus-wage ratios now controlling for complete contracts. The coefficient on Portugal is now insignificant, whereas Low Rank is still significant as on Table 3. The loss of significance of the organization coefficient is associated with the fact that most of the complete contracts in the sample (233 total) correspond to Portuguese workers, and only thirty-five (15%) to Dutch workers, who most likely were of low rank and earned lower bonus-wage ratios as shown on Figure 2. The inclusion of the cross products between complete contracts and low rank, and complete contracts and low rank and Portugal, returns significance to the organization coefficient on column (4). Identical results yield when the bonus share is the dependent variable.

¹⁶Given the tendencies on Table 4, it is likely that contract completeness is exogenous.

5 Concluding Remarks

When European overseas expansion began, countries were faced with a choice of how to organize their merchant empires. Even though sovereigns shared the same objective and technology, they chose to organize long-distance trade differently: the Portuguese opted for a crown monopoly whereas the Dutch opted by a private monopoly. Control at the top had significant impacts in firms' performances as well as in the way they were run. One possible dimension to observe the latter is the personnel policies of the different merchant empires, which should have varied with organizational type.

I use a principal agent model to explain different compensation structures on the basis of differing contractual incentives within the firm. A firm in which managers have poor incentives offers a compensation package with higher bonuses relative to wages. I then compare the model's implications with the patterns observed in the compensation schemes of the Portuguese and Dutch empires. Using data on labor compensation of Portuguese and Dutch workers overseas I verified that Portuguese workers have higher bonus-wage ratios than their Dutch counterparts. The result holds even after controlling for alternative explanations that may be affecting the ratios, such as worker's location, sector, rank, and contract completeness. Because of the amount of zeros in the dependent variable I use a Tobit model.

The different compensation schemes in the Portuguese and Dutch merchant empires is consistent with the theoretical implications of the model and provides further support to the historical evidence on the organization of merchant empires (Rei 2009): in a royally controlled firm there is less delegation of control, which makes monitoring more difficult when compared to a merchant controlled enterprise; as a result the compensation structure differs radically across firms.

The link between the economics of organization and the economics of personnel in merchant empires is clear: an organization controlled by the monarch provided managers with poor incentives, and as a consequence, labor contracts offered more bonuses (relative to wages) than in an organization controlled by merchants.

Understanding the alignment of incentives, for example, in terms of the firms' personnel policies, is a step forward to explain the divergent economic performances across merchant empires.

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Figure 1: Distribution of Bonus-Wage Ratios
(A) All contracts (B) Complete contracts only

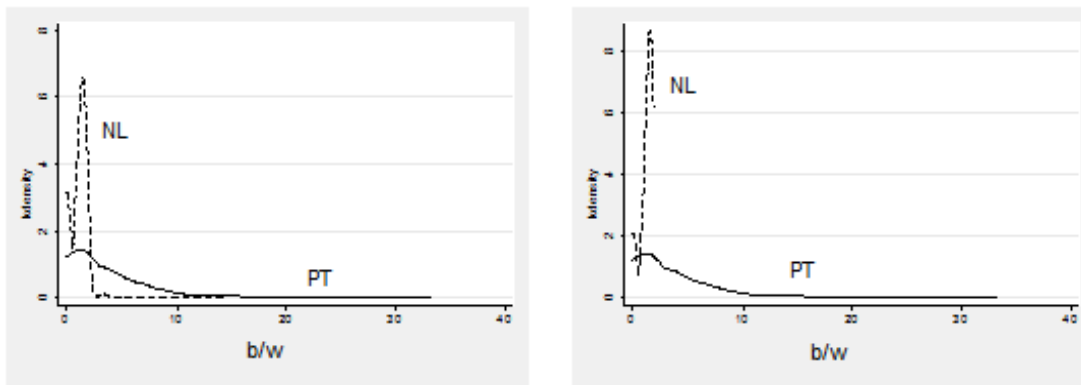


Figure 2: Distribution of Dutch Bonus-Wage Ratios

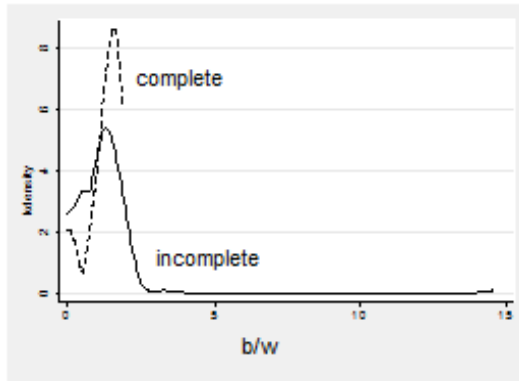


Figure 3: Portuguese and Dutch Locations

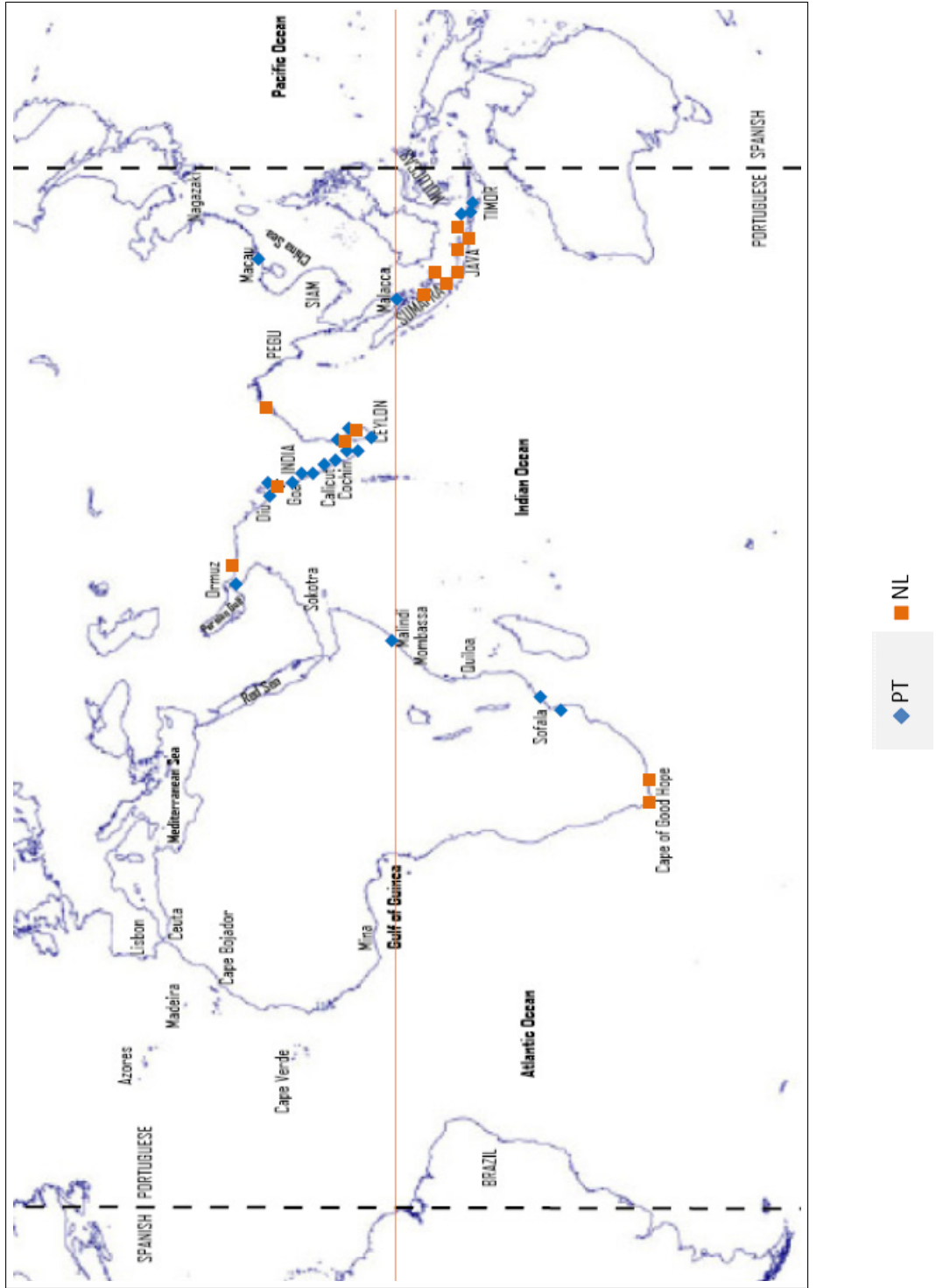


Table 1: Descriptive statistics: Bonus-Wage Ratios

	Portugal	Netherlands	Total
Average	3.43	1.19	2.49
Median	2.00	1.20	1.45
St. Dev.	4.83	1.43	3.94
Min.	0.00	0.00	0.00
Max.	33.33	14.57	33.33
N	159	115	274

Table 2: Descriptive Statistics: percentage of workers by Location, Occupation and Rank

	Portugal	Netherlands	Total
India	0.73	0.23	0.54
Indonesia	0.11	0.58	0.28
Other	0.16	0.19	0.18
Civil	0.76	0.97	0.83
Sea	0.06	0.03	0.05
Military	0.04	0.00	0.11
Other	0.14	0.00	0.01
Low rank	0.64	0.64	0.64
High rank	0.36	0.36	0.36
N	198	115	313

Sources: Lequin (1982), Luz (1960).

Table 3: Tobit Estimations

	(1)	(2)	(3)	(4)	(5)
Indonesia	-.721	-.812	-.061	-.028	.005
Civil	-1.811**	-1.216	-.680	-.122	.036
Low rank		-1.290*	-1.296*	.105	-.146**
Portugal			1.662**	1.075***	.148**
_Cons	3.204***	3.534***	1.923*	.317*	.449***
N	274	274	274	193	313
Pseudo R ²	.005	.008	.012	.211	.027

Significance: *10%, **5%, ***1%.

Dependent variable: (1), (2), (3) b/w; (4) log(b/w); (5) b/(b+w).

Table 4: Exit Motives for Dutch Workers

	#	%
Arrival to the Netherlands	15	13
Death	53	46
Departure from the East	20	17
Fired	1	1
Retired	1	1
Unknown	25	22
Total	115	100

Table 5: Tobit Model Controlling for Complete Contracts

	(1)	(2)	(3)	(4)
Indonesia	-.191	-.058	.056	-.046
Civil	1.928*	-.654	-.238	.015
Low rank	.034	-1.350**	.681	.658
Portugal	No	1.168	1.133	3.239*
Complete	.193	.725	2.736*	.922
Complete*Low			-3.048**	-.686
Complete*Low*PT				-2.838
_Cons	-.884	1.705	.005	.164
N	115	274	274	274
Pseudo R ²	.010	.012	.015	.017

Significance: *10%, **5%, ***1%.

Dependent variable: bonus-wage ratio.